To: Christ, Lisa[Christ.Lisa@epa.gov]
From: Hernandez-Quinones, Samuel
Sent: Mon 8/10/2015 6:06:34 PM
Subject: Re: OSWER comments on the DW PAG
OSWER Comment Binning.docx

Hi Lisa,

Please see the attached document for the binning of the OSWER Comments.

Sam

==

Samuel Hernández Quiñones, P.E.
Environmental Engineer
Environmental Protection Agency
Office of Water
1200 Pennsylvania Ave. NW
Washington, DC 20460
202-564-1735

"USEPA Protecting Human Health and the Environment"

From: Christ, Lisa
Sent: Monday, August 10, 2015 12:46 PM
To: Hernandez-Quinones, Samuel
Subject: RE: OSWER comments on the DW PAG

Hi Sam – We'll call you since Jerry's out today and Lee and Sara are coming here.

Thanks-

Lisa

From: Hernandez-Quinones, Samuel
Sent: Monday, August 10, 2015 12:41 PM
To: Christ, Lisa
Subject: Re: OSWER comments on the DW PAG

Hi Lisa,

Yes I will send it to you before the meeting. You can call me at Ex. 6 - Personal Privacy or if there are more people joining the call I can send out my conference call info. Let me know your preference.

Sam

==

Samuel Hernández Quiñones, P.E.
Environmental Engineer
Environmental Protection Agency
Office of Water
1200 Pennsylvania Ave. NW
Washington, DC 20460
202-564-1735

"USEPA Protecting Human Health and the Environment"

From: Christ, Lisa
Sent: Monday, August 10, 2015 12:02 PM
To: Hernandez-Quinones, Samuel
Subject: FW: OSWER comments on the DW PAG
When: Monday, August 10, 2015 2:30 PM-4:00 PM.
Where: DCRoomEast2339/DC-ICC-OW-OGWDW

Hi Sam –

Will you have the OSWER comments table prepared for today's meeting? What number can we call you at?

Lisa

-----Original Appointment-----
From: Christ, Lisa
Sent: Friday, August 07, 2015 1:58 PM
To: Christ, Lisa; Hernandez-Quinones, Samuel; Ellis, Jerry; Veal, Lee; DeCair, Sara
Subject: OSWER comments on the DW PAG
When: Monday, August 10, 2015 2:30 PM-4:00 PM (UTC-05:00) Eastern Time (US & Canada).
Where: DCRoomEast2339/DC-ICC-OW-OGWDW

The purpose of this meeting is to determine how to address OSWER comments in preparation to brief Peter and Mike next Tuesday.

To: Ellis, Jerry[Ellis.Jerry@epa.gov]; Wieder, Jessica[Wieder.Jessica@epa.gov]
Cc: Christ, Lisa[Christ.Lisa@epa.gov]; Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]
From: DeCair, Sara
Sent: Thur 7/16/2015 6:06:31 PM
Subject: RE: Revised versions - fact sheets
General Public Fact Sheet for DW PAG 7-16-15sd.docx
Technical Fact Sheet for DW PAG 7-16-15sd.docx

Jerry,

I've made my suggestions in redline and I think Jessica will provide input from the public information officer perspective next. We have the Southern Exposure full scale exercise down in South Carolina next week so we are going to be really busy, but we're also likely to have some discussions on water and the (simulated) media and public!

I'm sorry I didn't see your updated versions this morning before I got done with these. I can help watch out for the latest edits in clean versions once you've had time to see what you think of these. Thank you for keeping us on track to finalize the fact sheets!

Sara

From: Ellis, Jerry
Sent: Wednesday, July 15, 2015 4:51 PM
To: Wieder, Jessica; DeCair, Sara
Cc: Christ, Lisa; Hernandez-Quinones, Samuel
Subject: RE: Revised versions - fact sheets

Hi Jessica/Sara:

Here are the most recent versions of the fact sheets. I have included edits (track-changes) based on Lisa's review.

Jerry L. Ellis, Jr.

Environmental Scientist

U.S. Environmental Protection Agency

Standards and Risk Management Division

Office of Ground Water and Drinking Water

1200 Pennsylvania Ave. (4607M), N.W.

Washington, D.C. 20460

Phone: 202-564-2766

From: Ellis, Jerry
Sent: Monday, July 13, 2015 6:00 PM
To: Wieder, Jessica; DeCair, Sara
Subject: Revised versions - fact sheets

Jessica/ Sara:

Here are 2nd drafts of the fact sheets. Sara, I need help with a "plain language" definition of millirem; NRC's definition is too technical. Also, last question on the technical fact sheet I need a close review and suggestions on question #4.

Jerry L. Ellis, Jr.

Environmental Scientist

U.S. Environmental Protection Agency

Standards and Risk Management Division

Office of Ground Water and Drinking Water

1200 Pennsylvania Ave. (4607M), N.W.

Washington, D.C. 20460

Phone: 202-564-2766

To: Christ, Lisa[Christ.Lisa@epa.gov]; Veal, Lee[Veal.Lee@epa.gov]
Cc: Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]; Ellis, Jerry[Ellis.Jerry@epa.gov]
From: DeCair, Sara
Sent: Wed 7/8/2015 8:28:09 PM
Subject: RE: New Internal Q&As, new Project Plan
Q&A Document 7-8-2015.docx

Thank you! Your edits are really helpful. I've updated it and cleaned it up, and we can hang on to it for when it's needed. I'm thinking when we get OSWER's comments, we'll need to use this for our discussions internally. Here is the cleaned up version.

From: Christ, Lisa
Sent: Wednesday, July 08, 2015 2:55 PM
To: DeCair, Sara; Veal, Lee
Cc: Hernandez-Quinones, Samuel; Ellis, Jerry
Subject: RE: New Internal Q&As, new Project Plan

Hi Ladies –

I had a few comments and added a Q&A based on a question from Ken Kopocis. I think it's close to ready for the ODs. Sam is out until 7/20.

Lisa

From: DeCair, Sara
Sent: Wednesday, July 08, 2015 12:05 PM
To: Veal, Lee; Christ, Lisa
Subject: New Internal Q&As, new Project Plan

Lee, Lisa,

I made edits to the subject documents based on yesterday's OD level questions, and feedback we got during our last briefing with Mike and Peter. In the Q&As, I highlighted all the new material (and kept two different approaches to the cumulative risk question for our own info). In the

Project Plan, I listed rev dates and status of all our associated documents, and cut out all the steps we've accomplished so far to keep it to two pages. I got input from Mike's chief of staff, Andrea, and would be interested in yours. Do you think these could be good to send up to our ODs?

Thank you!

Sara D. DeCair

http://www.epa.gov/radiation/rert/pags.html

202-343-9108

Room 1416 B in WJC West

To: Edwards, Jonathan[Edwards.Jonathan@epa.gov]; Christ, Lisa[Christ.Lisa@epa.gov]
Cc: Clark, Becki[Clark.Becki@epa.gov]; Greene, Ashley[Greene.Ashley@epa.gov]; Galada, Heather[Galada.Heather@epa.gov]; Oshida, Phil[Oshida.Phil@epa.gov]; Burneson, Eric[Burneson.Eric@epa.gov]
From: Grevatt, Peter
Sent: Wed 7/8/2015 12:35:05 PM
Subject: FW: Draft Drinking Water PAG for OSWER review
EPA PAG Comments _EXCERPT OF WATER TAB with resolution text deleted.xlsx

Thanks for your draft responses Jonathan et al. I modified slightly to make sure we were fully responsive to the issues that I thought Jim was focused on. We'll keep you posted on what we hear back.

From: Grevatt, Peter
Sent: Wednesday, July 08, 2015 8:03 AM
To: Woolford, James; Flynn, Mike
Cc: 'Becki Clark'
Subject: RE: Draft Drinking Water PAG for OSWER review

Thanks Jim. Good questions. Here are responses, and we would of course be happy to discuss if that would be helpful.

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

From: Woolford, James
Sent: Monday, July 06, 2015 5:56 PM
To: Flynn, Mike
Cc: Grevatt, Peter
Subject: RE: Draft Drinking Water PAG for OSWER review

Was just reading this over. Sorry I missed the brief.

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

Thanks

Jim Woolford, Director

Office of Superfund Remediation and Technology Innovation

Office of Solid Waste and Emergency Response

US Environmental Protection Agency

1200 Penn. Ave., NW

Washington, DC 20460

(Mail Code 5201-P)

Phone: (703) 603 8960– Main Office Line

Physically located at:

Room 5622

One Potomac Yard (South)
2777 S. Crystal Dr.
Arlington, VA 22202

From: Flynn, Mike
Sent: Wednesday, June 24, 2015 5:30 PM
To: Cheatham, Reggie; Woolford, James
Cc: Grevatt, Peter; Tulis, Dana; Gardner, Monica; Fitz-James, Schatzi; Kudarauskas, Paul; DeCair, Sara; Hernandez-Quinones, Samuel; Edwards, Jonathan; Burneson, Eric; Perrin, Alan; Christ, Lisa
Subject: Draft Drinking Water PAG for OSWER review
Importance: High

Reggie and Jim,

Peter and I appreciate your time and support on the drinking water PAG proposal and, as you know, we're anxious to get this to the Office of Policy soon. We hope yesterday's briefing and discussion with your staff will enable you to get feedback to us on this proposal by July 14. I've attached the draft PAG chapter for your review.

OW and OAR staff are available to discuss any of the proposal details as needed and when it's convenient for you. Please contact Sam Hernandez at (202) 564-1735 or Sara DeCair at (202) 343-9108 with any questions or to set up a meeting; please direct any comments or suggestions you have on the PAG chapter to them as well.

Again, thank you in advance for your support and input, and don’t hesitate to call Peter or me if you have questions.

Thanks,

Mike

To: Grevatt, Peter[Grevatt.Peter@epa.gov]; Christ, Lisa[Christ.Lisa@epa.gov]
Cc: Flynn, Mike[Flynn.Mike@epa.gov]; Clark, Becki[Clark.Becki@epa.gov]; Oshida, Phil[Oshida.Phil@epa.gov]; Perrin, Alan[Perrin.Alan@epa.gov]; DeCair, Sara[DeCair.Sara@epa.gov]; Veal, Lee[Veal.Lee@epa.gov]; Boyd, Mike[Boyd.Mike@epa.gov]; Wieder, Jessica[Wieder.Jessica@epa.gov]
From: Edwards, Jonathan
Sent: Tue 7/7/2015 8:04:42 PM
Subject: RE: Draft Drinking Water PAG for OSWER review
EPA PAG Comments _EXCERPT OF WATER TAB with resolution text deleted.xlsx

Ex. 5 - Deliberative Process

****

Answers to Jim's Questions:

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

From: Grevatt, Peter
Sent: Monday, July 06, 2015 8:11 PM
To: Christ, Lisa; Edwards, Jonathan
Cc: Flynn, Mike; Clark, Becki; Oshida, Phil
Subject: Fwd: Draft Drinking Water PAG for OSWER review

I'd like to get back to Jim tomorrow. Can you please connect in the morning to craft a response? Ex. 5 - Deliberative Process Thanks.

Sent from my iPhone

Begin forwarded message:

> **From:** "Woolford, James" <Woolford.James@epa.gov>
> **Date:** July 6, 2015 at 5:56:11 PM EDT
> **To:** "Flynn, Mike" <Flynn.Mike@epa.gov>
> **Cc:** "Grevatt, Peter" <Grevatt.Peter@epa.gov>
> **Subject: RE: Draft Drinking Water PAG for OSWER review**
>
> Was just reading this over. Sorry I missed the brief.
>
> **Ex. 5 - Deliberative Process**
>
> Thanks
>
> Jim Woolford, Director

Office of Superfund Remediation and Technology Innovation

Office of Solid Waste and Emergency Response

US Environmental Protection Agency

1200 Penn. Ave., NW

Washington, DC 20460

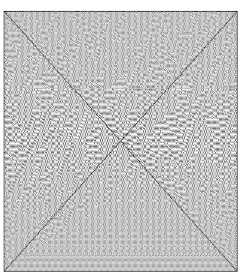
(Mail Code 5201-P)

Phone: (703) 603 8960– Main Office Line

Physically located at:

Room 5622

One Potomac Yard (South)
2777 S. Crystal Dr.
Arlington, VA 22202



From: Flynn, Mike
Sent: Wednesday, June 24, 2015 5:30 PM
To: Cheatham, Reggie; Woolford, James
Cc: Grevatt, Peter; Tulis, Dana; Gardner, Monica; Fitz-James, Schatzi; Kudarauskas, Paul; DeCair, Sara; Hernandez-Quinones, Samuel; Edwards, Jonathan; Burneson, Eric; Perrin,

Alan; Christ, Lisa
Subject: Draft Drinking Water PAG for OSWER review
Importance: High

Reggie and Jim,

Peter and I appreciate your time and support on the drinking water PAG proposal and, as you know, we're anxious to get this to the Office of Policy soon. We hope yesterday's briefing and discussion with your staff will enable you to get feedback to us on this proposal by July 14. I've attached the draft PAG chapter for your review.

OW and OAR staff are available to discuss any of the proposal details as needed and when it's convenient for you. Please contact Sam Hernandez at (202) 564-1735 or Sara DeCair at (202) 343-9108 with any questions or to set up a meeting; please direct any comments or suggestions you have on the PAG chapter to them as well.

Again, thank you in advance for your support and input, and don't hesitate to call Peter or me if you have questions.

Thanks,

Mike

To: Edwards, Jonathan[Edwards.Jonathan@epa.gov]; DeCair, Sara[DeCair.Sara@epa.gov]; Perrin, Alan[Perrin.Alan@epa.gov]
Cc: Christ, Lisa[Christ.Lisa@epa.gov]; Wieder, Jessica[Wieder.Jessica@epa.gov]; Boyd, Mike[Boyd.Mike@epa.gov]
From: Veal, Lee
Sent: Tue 7/7/2015 4:54:46 PM
Subject: REVISED : Draft Drinking Water PAG for OSWER review
EPA PAG Comments _EXCERPT OF WATER TAB with resolution text deleted.xlsx

All,

Please take a look at these changes.

Answers to Jim's Questions:

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

Begin forwarded message:

From: "Woolford, James" <Woolford.James@epa.gov>
Date: July 6, 2015 at 5:56:11 PM EDT
To: "Flynn, Mike" <Flynn.Mike@epa.gov>
Cc: "Grevatt, Peter" <Grevatt.Peter@epa.gov>
Subject: RE: Draft Drinking Water PAG for OSWER review

Was just reading this over. Sorry I missed the brief.

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

Thanks

Jim Woolford, Director

Office of Superfund Remediation and Technology Innovation

Office of Solid Waste and Emergency Response

US Environmental Protection Agency

1200 Penn. Ave., NW

Washington, DC 20460

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Phone: (703) 603 8960– Main Office Line

Physically located at:

Room 5622

One Potomac Yard (South)
2777 S. Crystal Dr.
Arlington, VA 22202

From: Flynn, Mike
Sent: Wednesday, June 24, 2015 5:30 PM
To: Cheatham, Reggie; Woolford, James
Cc: Grevatt, Peter; Tulis, Dana; Gardner, Monica; Fitz-James, Schatzi; Kudarauskas, Paul; DeCair, Sara; Hernandez-Quinones, Samuel; Edwards, Jonathan; Burneson, Eric; Perrin, Alan; Christ, Lisa
Subject: Draft Drinking Water PAG for OSWER review
Importance: High

Reggie and Jim,

Peter and I appreciate your time and support on the drinking water PAG proposal and, as you know, we're anxious to get this to the Office of Policy soon. We hope yesterday's briefing and discussion with your staff will enable you to get feedback to us on this proposal by July 14. I've attached the draft PAG chapter for your review.

OW and OAR staff are available to discuss any of the proposal details as needed and when it's convenient for you. Please contact Sam Hernandez at (202) 564-1735 or Sara DeCair at (202) 343-9108 with any questions or to set up a meeting; please direct any comments or suggestions you have on the PAG chapter to them as well.

Again, thank you in advance for your support and input, and don't hesitate to call Peter or me if you have questions.

Thanks,

Mike

<image001.png>

To: Christ, Lisa[Christ.Lisa@epa.gov]
From: Hernandez-Quinones, Samuel
Sent: Fri 6/26/2015 6:34:09 PM
Subject: Fw: Draft Drinking Water PAG proposal in review now
Water PAG draft Action Memo 5-28-2015.docx

FYI.

Sam

==

Samuel Hernández Quiñones, P.E.
Environmental Engineer
Environmental Protection Agency
Office of Water
1200 Pennsylvania Ave. NW
Washington, DC 20460
202-564-1735

"USEPA Protecting Human Health and the Environment"

From: DeCair, Sara
Sent: Friday, June 26, 2015 2:05 PM
To: Mazza, Carl; Ohanian, Edward; Raffaele, Kathleen; Foster, Stiven
Cc: Veal, Lee; Shoaff, John; Perrin, Alan; Hernandez-Quinones, Samuel; Royce, Christopher; Ellis, Jerry
Subject: Draft Drinking Water PAG proposal in review now

Good afternoon Carl,

Thank you for helping us share context for this proposal across offices. See attached our draft Action Memo for a little more detail and please advise if a briefing would be helpful. OGWDW and ORIA are making key staffers available at any time during these internal reviews, in particular myself, Sam Hernandez and Lisa Christ. I'm glad to find a mutually agreeable time if you tell me who should be invited.

OGWDW and ORIA have collaborated on this proposal for short term drinking water guidance for radiological emergencies (a drinking water PAG), which is a gap identified by commenters on the Agency's 2013 revision of the Protective Action Guides and Planning Guidance for Radiological Incidents ("PAG Manual"). The purpose of the PAG Manual is to help federal, state, and local authorities make decisions to protect the public during radiological emergencies. This drinking water proposal is to be announced in the Federal Register for public comments prior to inclusion in the full PAG Manual.

OGC has completed their reviews, and OHS and OSWER (OEM and OSRTI) are currently reviewing the proposal. We briefed Dana Tulis and Monica Gardner the other day, along with key staff in their offices. The interagency group that develops the PAG Manual is supportive of the approach. We're following a similar process path as we used with the 2013 PAG Manual, including reviews by offices involved in radiation protection and emergency response (OSWER, OHS, OW) then facilitation by OP and interagency review by OMB.

Thank you and I hope you have a lovely weekend,

Sara
202-343-9108

To: Burneson, Eric[Burneson.Eric@epa.gov]; Christ, Lisa[Christ.Lisa@epa.gov]; Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]
Cc: Edwards, Jonathan[Edwards.Jonathan@epa.gov]; Cherepy, Andrea[Cherepy.Andrea@epa.gov]; Veal, Lee[Veal.Lee@epa.gov]; DeCair, Sara[DeCair.Sara@epa.gov]
From: Perrin, Alan
Sent: Thur 6/25/2015 2:57:45 PM
Subject: FW: Draft Drinking Water PAG for OSWER review - confidential

FYI, wanted to pass this along since OW science advisor is included on the chain. (Carl Mazza is the OAR front office science advisor.) -Alan

~~~~~~~~~~~~~~~

Alan Perrin, Deputy Director
Radiation Protection Division, USEPA
ofc (202) 343-9775 | mbl (202) 279-0376

From: Edwards, Jonathan
Sent: Thursday, June 25, 2015 10:39 AM
To: Mazza, Carl
Cc: Cherepy, Andrea; Shoaff, John; DeCair, Sara; Veal, Lee; Perrin, Alan
Subject: Re: Draft Drinking Water PAG for OSWER review - confidential

Contact Sara DeCair at 343.9108

Sent from my iPhone

On Jun 25, 2015, at 9:01 AM, Mazza, Carl <Mazza.Carl@epa.gov> wrote:

> Are u folks involved in this. Who can I go to for info on our perspective for1pm mtg this afternoon.
>
> Sent from my iPhone
>
> Begin forwarded message:
>
>> **From:** "Ohanian, Edward" <Ohanian.Edward@epa.gov>
>> **Date:** June 25, 2015 at 8:54:30 AM EDT
>> **To:** "Raffaele, Kathleen" <raffaele.kathleen@epa.gov>, "Mazza, Carl" <Mazza.Carl@epa.gov>
>> **Cc:** "Firestone, Michael" <Firestone.Michael@epa.gov>
>> **Subject: RE: Draft Drinking Water PAG for OSWER review - confidential**
~~~~~~~~~~~~~~~

I am not aware of it but it got my attention per your email. Talk to you later. Thx, Ed

Edward V. Ohanian, Ph.D.

Associate Director for Science

Office of Water (MC: 4301T)

(202) 566-1117 (Voice)

(202) 566-0441(Fax)

Mailing Address:

U.S. Environmental Protection Agency

Rm: 5231P/Q WJC East (MC: 4301T)

1200 Pennsylvania Avenue, NW

Washington, DC 20460

Address for Visitors and Deliveries:

1201 Constitution Avenue, NW

WJC East, 5th Floor, Rm: 5231P/Q

Washington, DC 20004

From: Raffaele, Kathleen
Sent: Thursday, June 25, 2015 8:01 AM
To: Mazza, Carl; Ohanian, Edward
Cc: Firestone, Michael
Subject: FW: Draft Drinking Water PAG for OSWER review - confidential
Importance: High

Carl and Ed,

Did you know about this? I would like to talk with you about it at our meeting this afternoon.

Ex. 5 - Deliberative Process

Thanks!

Kathleen

Kathleen Raffaele, Ph.D.

Senior Science Advisor
Policy Analysis and Regulatory Management Staff
Office of Solid Waste and Emergency Response (OSWER)
U.S. EPA

Telephone (202) 566-0301

Mailcode 5103T

To: Christ, Lisa[Christ.Lisa@epa.gov]; Huff, Lisa[Huff.Lisa@epa.gov]
Cc: Greene, Ashley[Greene.Ashley@epa.gov]
From: Flaharty, Stephanie
Sent: Wed 6/24/2015 6:19:00 PM
Subject: FW: PAG briefing doc
1Water PAG briefing for OSWER ODs 6-23-2015.docx

Follow-up FYI…

From: Evalenko, Sandy
Sent: Wednesday, June 24, 2015 1:37 PM
To: Flaharty, Stephanie
Subject: FW: PAG briefing doc

Steph – I have the briefing document. Wow—This is the first that I've heard of this guidance.

Sandy

From: Cogliano, Gerain
Sent: Wednesday, June 24, 2015 1:28 PM
To: Evalenko, Sandy; Farrar, Wanda
Subject: FW: PAG briefing doc

Sandy and Wanda…

Attached is the PAG briefing document that was provided to OSWER. We were told that it was not tiered because of concerns over the document being leaked.

Hope this helps in tracking down what this document is.

Thanks,

Gerain

To: Grevatt, Peter[Grevatt.Peter@epa.gov]; Clark, Becki[Clark.Becki@epa.gov]
Cc: Greene, Ashley[Greene.Ashley@epa.gov]; Christ, Lisa[Christ.Lisa@epa.gov]; Oshida, Phil[Oshida.Phil@epa.gov]
From: Burneson, Eric
Sent: Mon 6/22/2015 7:08:44 PM
Subject: Response to Kens Question about the Rads PAG

Peter:

A few weeks ago you shared Ken's Comments on the Draft Drinking Water Protective Action Guidance Document. The team has addressed Ken's comments on the document and is ready to proceed. **Ex. 5 - Deliberative Process**
Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

Eric Burneson, P.E.

Director of Standards and Risk Management

Office of Ground Water and Drinking Water

US Environmental Protection Agency

Phone: 202-564-5250

Fax: 202 564 3760

To: Greene, Ashley[Greene.Ashley@epa.gov]
Cc: Christ, Lisa[Christ.Lisa@epa.gov]
From: Hernandez-Quinones, Samuel
Sent: Mon 6/22/2015 5:33:06 PM
Subject: Tues 6/23 Water PAG briefing mat'ls
Water PAG briefing for OSWER ODs 6-18-2015 clean.docx

Hi Ashley,

attached is the briefing document for tomorrow's meeting.

Thank You

Sam

==

Samuel Hernández Quiñones, P.E.
Environmental Engineer
Environmental Protection Agency
Office of Water
1200 Pennsylvania Ave. NW
Washington, DC 20460
202-564-1735

"USEPA Protecting Human Health and the Environment"

To: Christ, Lisa[Christ.Lisa@epa.gov]
From: Hernandez-Quinones, Samuel
Sent: Mon 6/22/2015 12:37:14 PM
Subject: Re: draft reply to Ken's questions PAG vs cyanotoxin HA

Hi Lisa,

Eric's version is accurate.

Ex. 5 - Deliberative Process

===

Samuel Hernández Quiñones, P.E.
Environmental Engineer
Environmental Protection Agency
Office of Water
1200 Pennsylvania Ave. NW
Washington, DC 20460
202-564-1735

"USEPA Protecting Human Health and the Environment"

From: Christ, Lisa
Sent: Thursday, June 18, 2015 3:35 PM
To: Hernandez-Quinones, Samuel
Subject: FW: draft reply to Ken's questions PAG vs cyanotoxin HA

Hi Sam,

Please review Eric’s response to Ken’s questions for accuracy.

Thanks-

Lisa

From: Burneson, Eric
Sent: Thursday, June 18, 2015 3:27 PM
To: Christ, Lisa
Subject: RE: draft reply to Ken's questions PAG vs cyanotoxin HA

Lisa:

First can you let me know how we plan to get back to Ken? Do we have to resubmit the PAGs document to Ken or are we transmitting a note to him in response to his comment without actually giving him another opportunity to revise. Please run this explanation by our technical folks to see if it is still accurate.

Second, we should look at this as an opportunity to craft a public Q&A on the document. I think our response is still a little too technical.

Ex. 5 - Deliberative Process

From: Christ, Lisa

Sent: Monday, June 15, 2015 2:10 PM
To: Burneson, Eric
Subject: FW: draft reply to Ken's questions PAG vs cyanotoxin HA

Eric-I worked with SRRB to prepare the below explanation. Let me know if you have comments, questions or concerns

Lisa

~~~~~~

Ken,

Ex. 5 - Deliberative Process
~~~~~~

From: Albert, Ryan
Sent: Monday, June 15, 2015 1:03 PM
To: Christ, Lisa
Cc: Holsinger, Hannah
Subject: FW: draft reply to Ken's questions

Hi Lisa,

Here is a draft slightly shortened from what Hannah kindly prepared. New language is in red (because we are shocking like that). Please be sure the clause I highlighted yellow is factually correct.

Please let us know if you need anything else.

Ex. 5 - Deliberative Process

Best regards,

Ryan

Ryan Albert, Ph.D.

Associate Chief

Standards and Risk Reduction Branch

Office of Ground Water and Drinking Water

United States Environmental Protection Agency

(202) 564-0763

From: Holsinger, Hannah
Sent: Thursday, June 11, 2015 1:55 PM
To: Albert, Ryan
Subject: RE: draft reply to Ken's questions

Ex. 5 - Deliberative Process

Thanks!

Hannah

From: Albert, Ryan
Sent: Thursday, June 11, 2015 9:11 AM
To: Holsinger, Hannah
Subject: FW: draft reply to Ken's questions

From: Christ, Lisa
Sent: Thursday, June 11, 2015 9:10 AM
To: Albert, Ryan
Subject: draft reply to Ken's questions

Ex. 5 - Deliberative Process

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Lisa Christ, Chief

Targeting and Analysis Branch

Office of Ground Water and Drinking Water

USEPA

1200 Pennsylvania Ave NW
Washington, DC 20460-0001
phone: 202.564.8354
fax: 202.564-3760
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Mail Code: 4607M

To: Christ, Lisa[Christ.Lisa@epa.gov]
Cc: Perrin, Alan[Perrin.Alan@epa.gov]
From: DeCair, Sara
Sent: Thur 6/18/2015 9:05:13 PM
Subject: RE: To provide to ODs: Fri. 6/12 Water PAG briefing mat'ls
Water PAG briefing for OSWER ODs 6-18-2015 clean.docx
Water PAG briefing for OSWER ODs 6-18-2015 hilited.docx

Lisa

I was working on the same thing – maybe if you like this version, with a few more changes I noted from Mike and Peter, each office can send the clean version up to their ODs? Then they can decide if they want to send it ahead of time to Reggie and Jim prior to Tuesday.

Thanks so much,

Sara

From: Christ, Lisa
Sent: Thursday, June 18, 2015 4:45 PM
To: DeCair, Sara; Veal, Lee; Hernandez-Quinones, Samuel; Ellis, Jerry; Edwards, Jonathan; Perrin, Alan
Subject: RE: To provide to ODs: Fri. 6/12 Water PAG briefing mat'ls

Hello –

I made the edits suggested by Peter and Mike during the pre-brief last Friday. Also, I suggest Sara cover the parts of the briefing highlighted yellow and Sam those highlighted blue. Let me know if anyone has questions or concerns.

Lisa

From: DeCair, Sara
Sent: Wednesday, June 10, 2015 4:43 PM
To: Veal, Lee; Christ, Lisa; Hernandez-Quinones, Samuel; Ellis, Jerry; Edwards, Jonathan; Perrin, Alan
Subject: To provide to ODs: Fri. 6/12 Water PAG briefing mat'ls

All;

Please provide these materials to Office Directors Mike Flynn and Peter Grevatt ASAP in preparation for Friday's 11 am pre-brief. I just did a little formatting improvement on the briefing itself, and the internal Q&A is unchanged.

I would like to open the briefing, then hand it to Sam for Background on SDWA and Options Considered sections, then I will go through Proposed Approach to the end. I plan to note any suggestions they have on the material and will revise the briefing for the meeting with OSWER on June 23.

See you all Friday!

Sara

Sara D. DeCair

http://www.epa.gov/radiation/rert/pags.html

202-343-9108

Room 1416 B in WJC West

To: Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]
Cc: Christ, Lisa[Christ.Lisa@epa.gov]
From: Ellis, Jerry
Sent: Wed 6/17/2015 9:30:10 PM
Subject: FW: Water PAG: Updated Communications Plan
DRAFT Drinking Water PAG Comms Plan Clean 5-13-15_lc.doc
DRAFT Drinking Water PAG Comms Plan Clean 6-17-15.doc

Hi Sam,

This is the most recent version of the communications plan is 6-17-15. I only added the nursing mothers category and added Sara's name as one of the contacts. The one that went to ORIA before we did the ODs meeting is the 5-13-15 version.

Jerry L. Ellis, Jr.

Environmental Scientist

U.S. Environmental Protection Agency

Standards and Risk Management Division

Office of Ground Water and Drinking Water

1200 Pennsylvania Ave. (4607M), N.W.

Washington, D.C. 20460

Phone: 202-564-2766

From: Ellis, Jerry
Sent: Wednesday, May 13, 2015 4:53 PM
To: DeCair, Sara; Wieder, Jessica
Subject: RE: Water PAG: Updated Communications Plan

Sorry, we had some last minute formatting edits and very editorial changes in section 3 and 7. Please see attached file with "lc" at the end.

Jerry L. Ellis, Jr.

Environmental Scientist

U.S. Environmental Protection Agency

Standards and Risk Management Division

Office of Ground Water and Drinking Water

1200 Pennsylvania Ave. (4607M), N.W.

Washington, D.C. 20460

Phone: 202-564-2766

From: Ellis, Jerry
Sent: Wednesday, May 13, 2015 3:03 PM
To: DeCair, Sara; Wieder, Jessica
Subject: Water PAG: Updated Communications Plan

Hi Sara,

Here is the updated version of the communications plan (clean and track-changes). We are still working on the internal Q&As. I suggest we schedule our next meeting on that document after I'm able to get out a cleaner draft. I'm thinking week of May 25th….I'm planning to travel on May 26th so any other day that week is fine.

Jerry L. Ellis, Jr.

Environmental Scientist

U.S. Environmental Protection Agency

Standards and Risk Management Division

Office of Ground Water and Drinking Water

1200 Pennsylvania Ave. (4607M), N.W.

Washington, D.C. 20460

Phone: 202-564-2766

To: Christ, Lisa[Christ.Lisa@epa.gov]
From: Hernandez-Quinones, Samuel
Sent: Tue 6/16/2015 5:18:41 PM
Subject: Clean Version of PAG Document (6/16/15)
Draft Protective Action Guide 6-16-15 OGWDW.docx

Attached

Sam

==

Samuel Hernández Quiñones, P.E.
Environmental Engineer
Environmental Protection Agency
Office of Water
1200 Pennsylvania Ave. NW
Washington, DC 20460
202-564-1735

"USEPA Protecting Human Health and the Environment"

To: Christ, Lisa[Christ.Lisa@epa.gov]
From: Hernandez-Quinones, Samuel
Sent: Tue 6/16/2015 4:08:19 PM
Subject: RE: r3evised PAG proposal
Draft Protective Action Guide 6-9-15 KenKopocis Comments.docx

Attached.

Sam

==

Samuel Hernández Quiñones, P.E.
Environmental Engineer
Environmental Protection Agency
Office of Water
1200 Pennsylvania Ave. NW
Washington, DC 20460
202-564-1735

"USEPA Protecting Human Health and the Environment"

From: Christ, Lisa
Sent: Tuesday, June 16, 2015 11:02 AM
To: Hernandez-Quinones, Samuel
Subject: r3evised PAG proposal

Hi Sam,

Please send me the revised PAG chapter that incorporates Ken's comments.

Thanks-

Lisa

~~~~~~

Lisa Christ, Chief

Targeting and Analysis Branch

Office of Ground Water and Drinking Water

USEPA

1200 Pennsylvania Ave NW
Washington, DC 20460-0001
phone: 202.564.8354
fax: 202.564-3760

Mail Code: 4607M
~~~~~~

To: Greene, Ashley[Greene.Ashley@epa.gov]
Cc: Christ, Lisa[Christ.Lisa@epa.gov]; DeCair, Sara[DeCair.Sara@epa.gov]
From: Ellis, Jerry
Sent: Thur 6/11/2015 1:53:21 PM
Subject: FW: To provide to ODs: Fri. 6/12 Water PAG briefing mat'ls
Water PAG briefing for ODs 6-10-2015.docx
Q&A Document 6-9-2015.docx

Ashley, not sure if Lisa sent already but we had slight formatting changes, so Peter should get these as latest version of these 2 documents. Thanks.

Jerry L. Ellis, Jr.

Environmental Scientist

U.S. Environmental Protection Agency

Standards and Risk Management Division

Office of Ground Water and Drinking Water

1200 Pennsylvania Ave. (4607M), N.W.

Washington, D.C. 20460

Phone: 202-564-2766

From: DeCair, Sara
Sent: Wednesday, June 10, 2015 4:43 PM
To: Veal, Lee; Christ, Lisa; Hernandez-Quinones, Samuel; Ellis, Jerry; Edwards, Jonathan; Perrin, Alan
Subject: To provide to ODs: Fri. 6/12 Water PAG briefing mat'ls

All;

Please provide these materials to Office Directors Mike Flynn and Peter Grevatt ASAP in preparation for Friday's 11 am pre-brief. I just did a little formatting improvement on the briefing itself, and the internal Q&A is unchanged.

I would like to open the briefing, then hand it to Sam for Background on SDWA and Options Considered sections, then I will go through Proposed Approach to the end. I plan to note any suggestions they have on the material and will revise the briefing for the meeting with OSWER on June 23.

See you all Friday!

Sara

Sara D. DeCair

http://www.epa.gov/radiation/rert/pags.html

202-343-9108

Room 1416 B in WJC West

To: Christ, Lisa[Christ.Lisa@epa.gov]
From: Huff, Lisa
Sent: Wed 6/10/2015 12:17:00 PM
Subject: RE: PAGs guidance

I picked up the comments yesterday and slid them under your door – sorry I didn't give you a heads up.

Lisa Foersom Huff

Associate Branch Chief

Targeting and Analysis Branch

Standards and Risk Management Division

Office of Groundwater and Drinking Water

U.S. EPA

EPA East Bldg. Rm. 2331 C

202-566-0787

From: Christ, Lisa
Sent: Wednesday, June 10, 2015 8:16 AM
To: Greene, Ashley; Bethel, Heidi; Huff, Lisa
Cc: Bissonette, Eric; Grevatt, Peter; Clark, Becki
Subject: RE: PAGs guidance

Some kind person left them under my door.

Thank you -

From: Greene, Ashley
Sent: Tuesday, June 09, 2015 9:46 AM
To: Bethel, Heidi; Huff, Lisa; Christ, Lisa
Cc: Bissonette, Eric; Grevatt, Peter; Clark, Becki
Subject: Re: PAGs guidance

Hi Lisa and Lisa,

Can you please pick up Ken's comments from Heidi?

Thanks,

Ashley

Sent from my iPhone

On Jun 9, 2015, at 6:30 AM, Bethel, Heidi <Bethel.Heidi@epa.gov> wrote:

> Hi,
>
> Ken returned the PAGs guidance to me this morning. He marked it up. If you want to send someone down to get it, I'm in 3311P.
>
> Thanks,
>
> Heidi
>
> Heidi Bethel, Ph.D.
>
> U.S. Environmental Protection Agency
>
> Special Assistant to the Deputy Assistant Administrator
>
> Office of Water
>
> WJC East 3311P
>
> (202) 566-2054

To: Christ, Lisa[Christ.Lisa@epa.gov]; Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]; Ellis, Jerry[Ellis.Jerry@epa.gov]
Cc: Perrin, Alan[Perrin.Alan@epa.gov]; Veal, Lee[Veal.Lee@epa.gov]
From: DeCair, Sara
Sent: Tue 6/9/2015 7:43:55 PM
Subject: Mat'ls for ODs 6/12 briefing
Water PAG briefing for ODs 6-9-2015.docx
Q&A Document 6-9-2015.docx
Water PAG FR Notice draft 6-9-2015.docx
DRAFT Drinking Water PAG Comms Plan Clean 5-13-15_lc.doc
Water PAG draft Action Memo 5-28-2015.docx
RP_AP-BR1-8_PAG-Manual_(DeCair) 6-9-2015.docx

All;

For Friday's pre-briefing with Mike and Peter, we talked about running through the attached Water PAG briefing for ODs paper in preparation for our meeting on 6/23 with OSWER ODs, and then moving to the Internal Q&As which we know will be of great interest to all the ODs. We should probably provide these ahead of time to our ODs. Maybe tomorrow, if you are comfortable with the content?

In hand at Friday's meeting, I'd like to have copies of the Action Memo, Comms Plan, FR Notice, the Water PAG chapter (aka proposal) and the Project Schedule. I did confirm that we are using the latest template for the FR Notice. I've attached clean versions of each of these except the Water PAG chapter -- Lisa has a new version of the chapter with Peter's comments incorporated, and it's currently being reviewed by Ken Kopocis.

Plz call or write if you need anything – thank you!

Sara

Sara D. DeCair

http://www.epa.gov/radiation/rert/pags.html

202-343-9108

Room 1416 B in WJC West

To: Christ, Lisa[Christ.Lisa@epa.gov]
From: Hernandez-Quinones, Samuel
Sent: Mon 6/1/2015 3:38:21 PM
Subject: Re: PAG chapter w/OGC comments incorporated.
Draft Protective Action Guide 6-1-15 OGWDW.docx
OW-OAR PAG brief final v2_LC.DOCX

Hi Lisa,

please find the draft email language and requested files below.

Thanks

Sam

============================

Hi,

Attached you will find the draft Chapter outlining the basis for the Radiation Protective Action Guide for Drinking Water. A PAG provides a projected dose value, at which specific protective action (do not drink order) is recommended to avoid or reduce the potential radiation exposure to an individual.

Ex. 5 - Deliberative Process

OGC has reviewed the document and provided comments and edits to OGWDW. All OGC edits have been incorporated in the draft document.

==

Samuel Hernández Quiñones, P.E.
Environmental Engineer
Environmental Protection Agency
Office of Water
1200 Pennsylvania Ave. NW
Washington, DC 20460
202-564-1735

"USEPA Protecting Human Health and the Environment"

From: Christ, Lisa
Sent: Monday, June 1, 2015 10:25 AM
To: Hernandez-Quinones, Samuel
Subject: RE: PAG chapter w/OGC comments incorporated.

Thanks Sam -- Please prepare a draft email that Peter could send to Ken. Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process Send it to me for a quick review and I'll forward it on to Ashley.

Thanks-

]Lisa

From: Hernandez-Quinones, Samuel
Sent: Monday, June 01, 2015 10:17 AM
To: Christ, Lisa
Subject: Re: PAG chapter w/OGC comments incorporated.

I think I do. I will look for it and send it to you also.

Sam

==

Samuel Hernández Quiñones, P.E.
Environmental Engineer
Environmental Protection Agency
Office of Water
1200 Pennsylvania Ave. NW
Washington, DC 20460
202-564-1735

"USEPA Protecting Human Health and the Environment"

From: Christ, Lisa
Sent: Monday, June 1, 2015 10:15 AM
To: Hernandez-Quinones, Samuel
Subject: RE: PAG chapter w/OGC comments incorporated.

I wanted to include a copy of the Stan Mieburg briefing with the document and a cover note. Do you have access to the briefing document?

From: Hernandez-Quinones, Samuel
Sent: Monday, June 01, 2015 10:13 AM
To: Christ, Lisa
Subject: Re: PAG chapter w/OGC comments incorporated.

Ok, I was planning on sending it to Ashley and ask her about the best way to get the document to Mr. Kopocis. But I will send it to you then.

Thanks

Sam

==

Samuel Hernández Quiñones, P.E.
Environmental Engineer
Environmental Protection Agency
Office of Water
1200 Pennsylvania Ave. NW
Washington, DC 20460
202-564-1735

"USEPA Protecting Human Health and the Environment"

From: Christ, Lisa
Sent: Monday, June 1, 2015 10:10 AM
To: Hernandez-Quinones, Samuel
Cc: Ellis, Jerry
Subject: RE: PAG chapter w/OGC comments incorporated.

Hi Sam,

Please send the revised document to me. I would like to get this to Ken today so he can begin his review.

Thanks-

Lisa

From: Christ, Lisa
Sent: Friday, May 29, 2015 9:11 AM
To: Hernandez-Quinones, Samuel
Cc: Ellis, Jerry
Subject: FW: PAG chapter w/OGC comments incorporated.

Hi Sam,

Attached are Peter's comments. I added my notes in the comment bubbles. Please accept all changes. We can respond to his questions during the pre-briefing on 6/12.

I'd like to have the document ready to go to Ken Monday.

Thanks-

Lisa

From: Grevatt, Peter
Sent: Friday, May 29, 2015 8:24 AM
To: Christ, Lisa
Cc: Greene, Ashley; Burneson, Eric; Clark, Becki
Subject: RE: PAG chapter w/OGC comments incorporated.

Lisa, please see my comments on the draft PAG document in the attachment. Thanks to you and your staff for another great job! I know that Mike is eager to press forward with this document. Please let me know if you have any questions on my comments and please also let me know if there are ways that I can help to expedite our next steps. Thanks, P.G.

From: Christ, Lisa
Sent: Thursday, May 28, 2015 5:33 PM
To: Grevatt, Peter
Cc: Greene, Ashley
Subject: FW: PAG chapter w/OGC comments incorporated.

Hi Peter –

Attached is the e-version of the radiation PAG. I appreciate the quick review.

Thanks-

Lisa

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Lisa Christ, Chief

Targeting and Analysis Branch

Office of Ground Water and Drinking Water

USEPA

1200 Pennsylvania Ave NW
Washington, DC 20460-0001
phone: 202.564.8354
fax: 202.564-3760

Mail Code: 4607M
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

To: Christ, Lisa[Christ.Lisa@epa.gov]
Cc: Greene, Ashley[Greene.Ashley@epa.gov]; Burneson, Eric[Burneson.Eric@epa.gov]; Clark, Becki[Clark.Becki@epa.gov]
From: Grevatt, Peter
Sent: Fri 5/29/2015 12:23:32 PM
Subject: RE: PAG chapter w/OGC comments incorporated.
Draft Protective Action Guide 5-15-15 grevatt comments.docx

Lisa, please see my comments on the draft PAG document in the attachment. Thanks to you and your staff for another great job! I know that Mike is eager to press forward with this document. Please let me know if you have any questions on my comments and please also let me know if there are ways that I can help to expedite our next steps. Thanks, P.G.

From: Christ, Lisa
Sent: Thursday, May 28, 2015 5:33 PM
To: Grevatt, Peter
Cc: Greene, Ashley
Subject: FW: PAG chapter w/OGC comments incorporated.

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Thanks-

Lisa

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Lisa Christ, Chief

Targeting and Analysis Branch

Office of Ground Water and Drinking Water

USEPA

1200 Pennsylvania Ave NW
Washington, DC 20460-0001
phone: 202.564.8354
fax: 202.564-3760

Mail Code: 4607M
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

To: Christ, Lisa[Christ.Lisa@epa.gov]
From: Strong, Jamie
Sent: Tue 5/19/2015 7:42:29 PM
Subject: RE: drinking water radiation protective action guides (PAG)

Lisa,

Thanks for keeping me in the loop. It would be helpful to see the rationale given what we are doing for the cyanotoxins.

Thanks,
Jamie

From: Christ, Lisa
Sent: Monday, May 11, 2015 4:35 PM
To: Strong, Jamie
Subject: drinking water radiation protective action guides (PAG)

Hi Jamie –

You may recall we met with anti-nuclear groups on April 21, to discuss their concerns which *include reducing and stopping radioactive exposures to the most vulnerable parts of our human life cycle, and preventing radionuclides from being treated as "preferred pollutants" in any EPA regulations or guidance, including the water and cleanup standards, the nuclear power fuel cycle rule, the Protective Action Guides (PAGs) and EPA's proposed new Carbon Rule.*

OGWDW is getting close to proposing a drinking water PAG and I wanted to make sure

Ex. 5 - Deliberative Process

Lisa

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Lisa Christ, Chief

Targeting and Analysis Branch

Office of Ground Water and Drinking Water

USEPA

1200 Pennsylvania Ave NW
Washington, DC 20460-0001
phone: 202.564.8354
fax: 202.564-3760

Mail Code: 4607M
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

To: Christ, Lisa[Christ.Lisa@epa.gov]; Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]
From: Ellis, Jerry
Sent: Tue 5/19/2015 3:26:43 PM
Subject: FW: Water PAG: Updated Communications Plan
DRAFT Drinking Water PAG Comms Plan track-changes 5-13-15.doc
DRAFT Drinking Water PAG Comms Plan Clean 5-13-15_lc.doc

FYI -

Jerry L. Ellis, Jr.

Environmental Scientist

U.S. Environmental Protection Agency

Standards and Risk Management Division

Office of Ground Water and Drinking Water

1200 Pennsylvania Ave. (4607M), N.W.

Washington, D.C. 20460

Phone: 202-564-2766

From: Ellis, Jerry
Sent: Tuesday, May 19, 2015 11:26 AM
To: DeCair, Sara
Cc: Wieder, Jessica; Veal, Lee; Nesky, Anthony
Subject: RE: Water PAG: Updated Communications Plan

Hi Sara,

Sam's trip got cancelled so he is in the office this week. We will not move the internal Q&As up the chain until after meeting with you and Jessica next week. It's only the communications plan we want to move forward with. The only differences between ORIA and OW's edits were re-wording a paragraph (refer to the track-changes version in Section 2. Message).

Jerry L. Ellis, Jr.

Environmental Scientist

U.S. Environmental Protection Agency

Standards and Risk Management Division

Office of Ground Water and Drinking Water

1200 Pennsylvania Ave. (4607M), N.W.

Washington, D.C. 20460

Phone: 202-564-2766

From: DeCair, Sara
Sent: Tuesday, May 19, 2015 11:16 AM
To: Ellis, Jerry
Cc: Wieder, Jessica; Veal, Lee; Nesky, Anthony
Subject: Re: Water PAG: Updated Communications Plan

Jerry

Copying Lee to loop her in. I'm not sure whether you were able to accept all Jessica's and my suggestions in the Comm Plan?
Either way, it might be wise to get this to Peter sooner and maybe we can do the same on our end.

You said Sam had some ideas for the internal Qs and As which are maybe even more important for our ODs... But that Sam is out this week so maybe can't work on that with our Comms expert, Tony?

Plz advise and we will decide on the best next step. Thanks!

Sent from my iPhone

On May 19, 2015, at 10:07 AM, Ellis, Jerry <Ellis.Jerry@epa.gov> wrote:

Hi Sara,

I believe that you are on travel this week, but just in case you are checking e-mails….wanted to let you know that we would like to send the communications plan along with the water chapter to our office director this week. The water chapter should back from OGC today and will be ready to move up the review chain. Do you think the communications plan is in good enough shape to move forward with the water chapter?

Jerry L. Ellis, Jr.

Environmental Scientist

U.S. Environmental Protection Agency

Standards and Risk Management Division

Office of Ground Water and Drinking Water

1200 Pennsylvania Ave. (4607M), N.W.

Washington, D.C. 20460

Phone: 202-564-2766

From: Ellis, Jerry
Sent: Wednesday, May 13, 2015 4:53 PM
To: DeCair, Sara; Wieder, Jessica
Subject: RE: Water PAG: Updated Communications Plan

Sorry, we had some last minute formatting edits and very editorial changes in section 3 and 7. Please see attached file with "lc" at the end.

Jerry L. Ellis, Jr.

Environmental Scientist

U.S. Environmental Protection Agency

Standards and Risk Management Division

Office of Ground Water and Drinking Water

1200 Pennsylvania Ave. (4607M), N.W.

Washington, D.C. 20460

Phone: 202-564-2766

From: Ellis, Jerry
Sent: Wednesday, May 13, 2015 3:03 PM
To: DeCair, Sara; Wieder, Jessica
Subject: Water PAG: Updated Communications Plan

Hi Sara,

Here is the updated version of the communications plan (clean and track-changes). We are still working on the internal Q&As. I suggest we schedule our next meeting on that document after I'm able to get out a cleaner draft. I'm thinking week of May 25th….I'm planning to travel on May 26th so any other day that week is fine.

Jerry L. Ellis, Jr.

Environmental Scientist

U.S. Environmental Protection Agency

Standards and Risk Management Division

Office of Ground Water and Drinking Water

1200 Pennsylvania Ave. (4607M), N.W.

Washington, D.C. 20460

Phone: 202-564-2766

To: Christ, Lisa[Christ.Lisa@epa.gov]
From: Hernandez-Quinones, Samuel
Sent: Mon 5/18/2015 6:18:55 PM
Subject: Re: rads PAG
Compared Document with OGC Comments - Draft Protective Action Guide 5-15-15.docx

Hi Lisa,

attached is the file which incorporates Paul's edits together with the edits we had received from Office of Air and from Eric's B Review.

I will have a meeting with Paul tomorrow morning to go over some questions he had and to see his reaction from how I addressed his comments . I think that after tomorrow's meeting we should be able to move ahead with Peter's review. I will then send you a clean version with all changes accepted and formatted.

I also sent this file to Paul so that he can review before the meeting how his comments were addressed and incorporated into the chapter.

Thank You

Sam

==

Samuel Hernández Quiñones, P.E.
Environmental Engineer
Environmental Protection Agency
Office of Water
1200 Pennsylvania Ave. NW
Washington, DC 20460
202-564-1735

"USEPA Protecting Human Health and the Environment"

From: Christ, Lisa
Sent: Monday, May 18, 2015 9:52 AM
To: Hernandez-Quinones, Samuel
Subject: rads PAG

Hi Sam,

Would it be possible to get the revised PAG chapter today? I'd like to move it on for Peter's review.

Thanks-

Lisa

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Lisa Christ, Chief

Targeting and Analysis Branch

Office of Ground Water and Drinking Water

USEPA

1200 Pennsylvania Ave NW
Washington, DC 20460-0001
phone: 202.564.8354
fax: 202.564-3760

Mail Code: 4607M
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

To: Christ, Lisa[Christ.Lisa@epa.gov]; Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]
From: Ellis, Jerry
Sent: Wed 5/13/2015 6:57:29 PM
Subject: PAG: Updated Communications Plan
DRAFT Drinking Water PAG Comms Plan Clean 5-13-15.doc

Hi Lisa and Sam:

Here is the updated document based on our conversation this morning. Thank you for the input.

Jerry L. Ellis, Jr.

Environmental Scientist

U.S. Environmental Protection Agency

Standards and Risk Management Division

Office of Ground Water and Drinking Water

1200 Pennsylvania Ave. (4607M), N.W.

Washington, D.C. 20460

Phone: 202-564-2766

To: Christ, Lisa[Christ.Lisa@epa.gov]; Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]
From: Ellis, Jerry
Sent: Tue 5/12/2015 3:16:27 PM
Subject: RE: Comms plan back to you
DRAFT Drinking Water PAG Comms Plan Clean 5-12-15.doc
DRAFT Drinking Water PAG Comms Plan track-changes 5-12-15.doc

Thank you for the comments Lisa. I consolidated your comments into the version with Sara's most recent edits. Clean file attached and track-changes version as well.

Jerry L. Ellis, Jr.

Environmental Scientist

U.S. Environmental Protection Agency

Standards and Risk Management Division

Office of Ground Water and Drinking Water

1200 Pennsylvania Ave. (4607M), N.W.

Washington, D.C. 20460

Phone: 202-564-2766

From: Christ, Lisa
Sent: Monday, May 11, 2015 12:48 PM
To: Ellis, Jerry; Hernandez-Quinones, Samuel
Subject: RE: Comms plan back to you

Hi Jerry –

I made a few edits too, see attached.

Lisa

From: Ellis, Jerry
Sent: Monday, May 11, 2015 12:45 PM
To: Hernandez-Quinones, Samuel; Christ, Lisa
Subject: FW: Comms plan back to you

Hi Sam and Lisa:

Sara had some add'l comments on the draft communications plan (see attached). Jessica is on vacation and Sara and I should be talking further today about their review process. Sara had mentioned moving the documents up through their management chain, and I didn't understand at what point in the process.

I set a meeting later this week to talk with you about any remaining concerns with the comm plan and internal Q&As.

Jerry L. Ellis, Jr.

Environmental Scientist

U.S. Environmental Protection Agency

Standards and Risk Management Division

Office of Ground Water and Drinking Water

1200 Pennsylvania Ave. (4607M), N.W.

Washington, D.C. 20460

Phone: 202-564-2766

From: DeCair, Sara
Sent: Monday, May 11, 2015 9:12 AM
To: Ellis, Jerry
Cc: Nesky, Anthony

Subject: Comms plan back to you

Jerry, I hope you're feeling better. Jessica and marked up the comms plan with some things we feel pretty strongly about, but need to check with you before this is ready for management review. We'll have to get this to our Division management in order to concur.

We're hoping to brief ODs across the Agency in June, so this will have to be final for the FR package to be ready. Please let me know when you can have this back to me so we can get this up the chain. Thank you so much!!

Sara

To: Christ, Lisa[Christ.Lisa@epa.gov]
Cc: Perrin, Alan[Perrin.Alan@epa.gov]; Cherepy, Andrea[Cherepy.Andrea@epa.gov]; Veal, Lee[Veal.Lee@epa.gov]
From: DeCair, Sara
Sent: Thur 5/7/2015 9:22:59 PM
Subject: Updated PAG proposal project plan - input by Monday?
RP_AP-BR1-8_PAG-Manual_(DeCair) 5-7-2015.docx

Lisa,

We are starting the process to schedule Peter and Mike's pre-brief and then joint ODs briefing planned for Jim Woolford and Reggie Cheatham of OSWER. If we're lucky, we can get those both scheduled in June and have OGC's review done by then too, so our final steps wouldn't be delayed.

Could you take a look at the attached Project Plan update (changes highlighted) and provide me any concerns or input by Monday? Mike asked that we do this now to ensure we are all on the same page. Then Andrea can help our scheduler, Debbie Cheng, get the meetings on our calendars.

Thank you so much!

Sara

Sara D. DeCair

http://www.epa.gov/radiation/rert/pags.html

202-343-9108

Room 1416 B in WJC West

To: Christ, Lisa[Christ.Lisa@epa.gov]
From: Hernandez-Quinones, Samuel
Sent: Wed 5/6/2015 1:29:47 PM
Subject: RE: slides for PR water symposium

Hi Lisa,

I got a message from OGC this morning regarding the PAGs review, they are requesting additional time to complete their review. I think I can talk to you about this today before I sent a response.

The slides for the symposium have to be submitted by May 14, 2015. I think we have some time to setup a meeting this week to talk about it.

I sent the response to the hotline question. I will let you know if they have any follow-up questions.

Sam

==

Samuel Hernández Quiñones, P.E.
Environmental Engineer
Environmental Protection Agency
Office of Water
1200 Pennsylvania Ave. NW
Washington, DC 20460
202-564-1735

"USEPA Protecting Human Health and the Environment"

From: Christ, Lisa
Sent: Wednesday, May 06, 2015 7:51 AM
To: Hernandez-Quinones, Samuel
Subject: FW: slides for PR water symposium

Hi Sam,

I'm following up on a few items. Please provide the status of OGC's review of the PAG, your presentation for the PR water symposium, and the response to the hotline on the radon question.

Thanks-

Lisa

From: Christ, Lisa
Sent: Thursday, April 30, 2015 11:07 AM
To: Hernandez-Quinones, Samuel
Subject: slides for PR water symposium

Hi Sam,

I just wanted to check in on the timing for my review of your presentation. I appreciate you coordinating with Mike Lowy on this.

Thanks-

Lisa

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Lisa Christ, Chief

Targeting and Analysis Branch

Office of Ground Water and Drinking Water

USEPA

1200 Pennsylvania Ave NW
Washington, DC 20460-0001
phone: 202.564.8354
fax: 202.564-3760

Mail Code: 4607M

To: Christ, Lisa[Christ.Lisa@epa.gov]; Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]
From: Ellis, Jerry
Sent: Tue 5/5/2015 7:25:51 PM
Subject: PAG Internal Q&As
Internal QandAs Drinking Water PAG 5-5-15 JLE.docx

Hi Sam and Lisa,

I have updated the Q&A document a bit more. I would like to talk with you both about the questions with comments and ORIA has asked about guidance for nursing mothers. Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

Jerry L. Ellis, Jr.

Environmental Scientist

U.S. Environmental Protection Agency

Standards and Risk Management Division

Office of Ground Water and Drinking Water

1200 Pennsylvania Ave. (4607M), N.W.

Washington, D.C. 20460

Phone: 202-564-2766

To: Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]; Christ, Lisa[Christ.Lisa@epa.gov]
From: Ellis, Jerry
Sent: Mon 5/4/2015 7:53:36 PM
Subject: Q&As and Communications Plan
Internal QandAs Drinking Water PAG 5-4-15 JLE.docx
DRAFT Drinking Water PAG Communications Plan (clean)_5-4-15 JLE.doc

FYI – Here are the updated documents that consolidates Jessica and Tony's edits and comments. I am still going to be working to update the Q&A document based on ORIA's comments and further discussion, hopefully at the end of the week. Tony had some suggestions for the communications plan that went beyond just editorial and didn't make sense to change.

Jerry L. Ellis, Jr.

Environmental Scientist

U.S. Environmental Protection Agency

Standards and Risk Management Division

Office of Ground Water and Drinking Water

1200 Pennsylvania Ave. (4607M), N.W.

Washington, D.C. 20460

Phone: 202-564-2766

To: Christ, Lisa[Christ.Lisa@epa.gov]
Cc: Ellis, Jerry[Ellis.Jerry@epa.gov]
From: Hernandez-Quinones, Samuel
Sent: Thur 4/30/2015 6:59:53 PM
Subject: FW: Request for Review of Drinking Water PAG Document

FYI.

Sam

==

Samuel Hernández Quiñones, P.E.
Environmental Engineer
Environmental Protection Agency
Office of Water
1200 Pennsylvania Ave. NW
Washington, DC 20460
202-564-1735

"USEPA Protecting Human Health and the Environment"

From: Bangser, Paul
Sent: Thursday, April 30, 2015 1:53 PM
To: Hernandez-Quinones, Samuel
Subject: RE: Request for Review of Drinking Water PAG Document

Hi Sam,

An update, I'm in the middle of reviewing the document, it shouldn't take me too much longer. However, it would make sense for me to confer with my management on it internally, before getting back to you. I still don't expect that will take too long. There isn't much in this document in terms of legal issues.

So far, I don't have any big questions or need for a meeting.

Thanks,

Paul

Paul Bangser

EPA Office of General Counsel

202-564-5479

bangser.paul@epa.gov

From: Hernandez-Quinones, Samuel
Sent: Wednesday, April 29, 2015 1:39 PM
To: Bangser, Paul
Cc: Wehling, Carrie
Subject: FW: Request for Review of Drinking Water PAG Document

Hi Mr Bangser,

I am following up on the request for review of the Drinking Water PAGs document that I previously sent to you. Please let me know if my original request can be accommodated, otherwise let me know if your workload requires a different time frame for completion of your review.

I would like to get some feedback on the timing of your review so I can let my managers know what the expectations are for the schedule of the PAGs concurrence chain.

Once again thank you for your time and remember that we are available to meet with you to provide additional information on the PAGs if needed.

Thank You

Sam

==

Samuel Hernández Quiñones, P.E.
Environmental Engineer
Environmental Protection Agency
Office of Water
1200 Pennsylvania Ave. NW
Washington, DC 20460
202-564-1735

"USEPA Protecting Human Health and the Environment"

To: Christ, Lisa[Christ.Lisa@epa.gov]
Cc: Ellis, Jerry[Ellis.Jerry@epa.gov]
From: Hernandez-Quinones, Samuel
Sent: Wed 4/29/2015 7:00:32 PM
Subject: Revised Chapter Drinking Water PAG
Revised Version 4-29-15 Draft Chapter Drinking Water PAG SHQ.docx

Hi Lisa,

Attached is the revised version of the Chapter based on the discussion we had this morning. Also here are some general responses we had for Office of Air regarding their comments.

Ex. 5 - Deliberative Process

Let me know if you have any comments or requests for additional changes.

Thank You

Sam

==

Samuel Hernández Quiñones, P.E.
Environmental Engineer
Environmental Protection Agency
Office of Water

1200 Pennsylvania Ave. NW
Washington, DC 20460
202-564-1735

"USEPA Protecting Human Health and the Environment"

To: Christ, Lisa[Christ.Lisa@epa.gov]; Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]
From: Ellis, Jerry
Sent: Tue 4/28/2015 1:04:54 PM
Subject: ORIA's comments on the Communications Plan and Internal Q&A's
Internal QandAs Drinking Water PAG 4-16-15-tnedits.docx
V 2 DRAFT Drinking Water PAG Communications Plan_4-16-15 jw.doc
V 2 DRAFT Drinking Water PAG Communications Plan_4-16-15-tn-comments.doc
Internal QandAs Drinking Water PAG 4-16-15 jw.docx

Lisa and Sam:

I received feedback from Jessica and Tony. Here are their edits and comments. I will be working to update the two documents today. We will need another quick review by ORIA before finalizing.

Jerry L. Ellis, Jr.

Environmental Scientist

U.S. Environmental Protection Agency

Standards and Risk Management Division

Office of Ground Water and Drinking Water

1200 Pennsylvania Ave. (4607M), N.W.

Washington, D.C. 20460

Phone: 202-564-2766

To: Christ, Lisa[Christ.Lisa@epa.gov]; Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]; Ellis, Jerry[Ellis.Jerry@epa.gov]
Cc: Veal, Lee[Veal.Lee@epa.gov]; Perrin, Alan[Perrin.Alan@epa.gov]
From: DeCair, Sara
Sent: Tue 4/28/2015 12:40:33 AM
Subject: markup and quick check for showstoppers
markup Drinking Water PAG 4-27-2015.docx
clean Drinking Water PAG 4-27-2015.docx

Lisa, Sam, Jerry,

I hope you don't find the attached markup overwhelming, the edits are really very, very small and I am sorry it took me a whole week to complete my review!

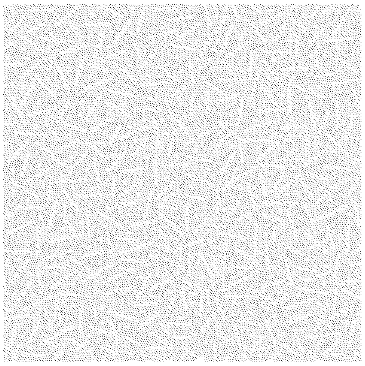
I sent the proposal to our OGC already, as you all did, and wanted to suggest that I send this new clean version (also attached) to my select Special Teams reviewers over in OSWER. The only big changes in it are deletion of two paragraphs highlighted in the markup.

Will you let me know if those deletions are problems, or showstoppers, for you? I don't want to proceed if we don't agree. Of course I am in sunny California this week (hence the time difference, no, I am not working into the night) but very available via email and cell phone if you'd like to discuss. Many thanks,

Sara

cell 202-738-2871

To: Christ, Lisa[Christ.Lisa@epa.gov]
Cc: Tidwell-Shelton, Patricia[Tidwell-Shelton.Patricia@epa.gov]
From: Lynch, Marissa
Sent: Mon 4/27/2015 12:37:53 PM
Subject: FW: FOR PROGRAM OFFICE CONCURRENCE: DRAFT Standard Operating Guideline for waste staging
WA 5-34 EPA Operational Guidelines - April 2015.docx



Good Morning Lisa,

It was a pleasure speaking with you earlier. Attached is the RAD document from ORD/NHSRC-Standard Operating Guideline for early phase waste staging following a radiological incident. The document provides technical information to rad incident first responders that may help them minimize difficulties in the intermediate and long-term cleanup phase of the response. The document is intended to be a compilation of best practices from a technical standpoint, without attempting to deal with the regulatory complexities. But along with that, ORD wants to ensure that they don't say anything that is contrary to the current statutory framework. This would include properly caveating recommendations and deleting explicit references to, say CERCLA for instance. The deadline to get back to ORD is May 15. I am planning on speaking with my management by May 12. Please let me know if you have any questions or concerns. We appreciate you taking the time out to review the document.

Have a great day!

Marissa

To: Christ, Lisa[Christ.Lisa@epa.gov]
Cc: Veal, Lee[Veal.Lee@epa.gov]; Perrin, Alan[Perrin.Alan@epa.gov]; Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]; Ellis, Jerry[Ellis.Jerry@epa.gov]; Burneson, Eric[Burneson.Eric@epa.gov]; Wieder, Jessica[Wieder.Jessica@epa.gov]
From: DeCair, Sara
Sent: Wed 4/22/2015 9:29:54 PM
Subject: RE: PAGs project plan check-in

Lisa,

The schedule you sent looks awesome, and I think if we stay in close coordination, we can meet the milestones. I'm sending the chapter on to our OGC contact, Sue Stahle, for legal review and also doing a slight bit of editing with Alan on it. We should be able to get back to you no later than early next week on all the FR package pieces so we can be ready to roll!

Meantime, I'm doing some staff-level coordination with my counterparts in OSWER and OHS, and will run any issues they raise past you all. Thank you so much for the hard work on this – much appreciated.

Sara

202-343-9108

From: Christ, Lisa
Sent: Thursday, April 16, 2015 3:12 PM
To: DeCair, Sara
Cc: Veal, Lee; Perrin, Alan; Hernandez-Quinones, Samuel; Ellis, Jerry; Burneson, Eric
Subject: RE: PAGs project plan check-in

Hi Sara –

Thanks for providing a revised schedule. I think we may be able to move things a little quicker (hopefully) than you've laid out. We'll do better keeping to this schedule!

Attached are several documents related to the PAG and schedule.

1. Updated PAG proposal chapter (based on PAG subcommittee comments)

2. Comments on the Action Memo

3. Draft OW communication plan

4. Comments on the FRN (note: as of this week there's a new FRN template)

5. Very draft internal Q&As

6. Feedback on the schedule

We intend to send the updated chapter to our OGC reviewer today and request comments by April 30.

Do you need our help coordinating OSWER and/or OHS review?

Thank you for your patience –

Lisa

From: DeCair, Sara
Sent: Monday, April 13, 2015 3:43 PM
To: Christ, Lisa
Cc: Veal, Lee; Perrin, Alan
Subject: PAGs project plan check-in

Lisa,

Lisa,

Lee and I were talking about getting your feeling on the dates for our next several steps on the drinking water PAG proposal. I know Sam's busy with the proposal edits right now, but maybe you can see if you think the months listed in the attached two page plan are achievable, given some unpredictability noted at the bottom.

When I talked with Jerry last week about Comms materials, we thought our ODs are a good audience for internal Qs and As and the messaging, since they want to feel knowledgable and of course get to guide our next steps forward.

I'll be in my office Tuesday through Thursday this week and Lee will be traveling but available if we need to get on a call together. Thank you for any input you have on the timeline!

Sara 202-343-9108

To: Christ, Lisa[Christ.Lisa@epa.gov]
Cc: Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]; Ellis, Jerry[Ellis.Jerry@epa.gov]
From: DeCair, Sara
Sent: Thur 4/16/2015 9:07:52 PM
Subject: RE: PAGs project plan check-in

Awesome, thank you!

From: Christ, Lisa
Sent: Thursday, April 16, 2015 5:06 PM
To: DeCair, Sara
Cc: Hernandez-Quinones, Samuel; Ellis, Jerry
Subject: RE: PAGs project plan check-in

Trying again!

Ex. 5 - Deliberative Process Please review this version.

L

From: DeCair, Sara
Sent: Thursday, April 16, 2015 4:32 PM
To: Christ, Lisa
Subject: RE: PAGs project plan check-in

Oops, that is important! If you have the deleted item handy, will you put it in? I am crunching a huge analysis right now and trying to get done by 6 pm – if not, I can really add it in when I review in a day or two. Thank you!!

From: Christ, Lisa
Sent: Thursday, April 16, 2015 3:59 PM
To: DeCair, Sara
Cc: Veal, Lee; Perrin, Alan; Hernandez-Quinones, Samuel; Ellis, Jerry; Burneson, Eric
Subject: RE: PAGs project plan check-in

Ex. 5 - Deliberative Process

I can send a revised version or you can add the language back in during your review - just let me know.

Lisa

From: DeCair, Sara
Sent: Thursday, April 16, 2015 3:50 PM
To: Christ, Lisa
Cc: Veal, Lee; Perrin, Alan; Hernandez-Quinones, Samuel; Ellis, Jerry; Burneson, Eric
Subject: RE: PAGs project plan check-in

Lisa,

Fabulous! This will keep me busy for a few – thank you! I will also send the proposal to our OGC rep now and can then make sure our ODs have done a heads up to both parts of OSWER before those reviews start. I can facilitate that and OHS, no problem.

Jessica and I will get back to you on Comms and more Answers for the Q and A's soon. Again, thank you -- I'm really excited to get this up and out, as you know, so I'll touch base on schedule next week.

Sara

From: Christ, Lisa
Sent: Thursday, April 16, 2015 3:12 PM
To: DeCair, Sara
Cc: Veal, Lee; Perrin, Alan; Hernandez-Quinones, Samuel; Ellis, Jerry; Burneson, Eric
Subject: RE: PAGs project plan check-in

Hi Sara –

Thanks for providing a revised schedule. I think we may be able to move things a little quicker (hopefully) than you've laid out. We'll do better keeping to this schedule!

Attached are several documents related to the PAG and schedule.

1. Updated PAG proposal chapter (based on PAG subcommittee comments)

2. Comments on the Action Memo

3. Draft OW communication plan

4. Comments on the FRN (note: as of this week there's a new FRN template)

5. Very draft internal Q&As

6. Feedback on the schedule

We intend to send the updated chapter to our OGC reviewer today and request comments by April 30.

Do you need our help coordinating OSWER and/or OHS review?

Thank you for your patience –

Lisa

From: DeCair, Sara
Sent: Monday, April 13, 2015 3:43 PM
To: Christ, Lisa
Cc: Veal, Lee; Perrin, Alan
Subject: PAGs project plan check-in

Lisa,

Lisa,

Lee and I were talking about getting your feeling on the dates for our next several steps on the drinking water PAG proposal. I know Sam's busy with the proposal edits right now, but maybe you can see if you think the months listed in the attached two page plan are achievable, given some unpredictability noted at the bottom.

When I talked with Jerry last week about Comms materials, we thought our ODs are a good audience for internal Qs and As and the messaging, since they want to feel knowledgable and of course get to guide our next steps forward.

I'll be in my office Tuesday through Thursday this week and Lee will be traveling but available if we need to get on a call together. Thank you for any input you have on the timeline!

Sara 202-343-9108

To: Christ, Lisa[Christ.Lisa@epa.gov]; Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]
From: Ellis, Jerry
Sent: Thur 4/16/2015 6:24:55 PM
Subject: RE: PAG materials
V.2 DRAFT Drinking Water PAG Communications Plan_4-16-15.doc

Sorry Lisa, changed the Comm Plan. Added two edits we spoke about this morning. Please use this version. Thanks.

Jerry L. Ellis, Jr.

Environmental Scientist

U.S. Environmental Protection Agency

Standards and Risk Management Division

Office of Ground Water and Drinking Water

1200 Pennsylvania Ave. (4607M), N.W.

Washington, D.C. 20460

Phone: 202-564-2766

From: Ellis, Jerry
Sent: Thursday, April 16, 2015 2:19 PM
To: Christ, Lisa; Hernandez-Quinones, Samuel
Subject: PAG materials

Here's the:

Draft Action Memo

Desk Statement

Communications Plan

Internal Q&A's

Jerry L. Ellis, Jr.

Environmental Scientist

U.S. Environmental Protection Agency

Standards and Risk Management Division

Office of Ground Water and Drinking Water

1200 Pennsylvania Ave. (4607M), N.W.

Washington, D.C. 20460

Phone: 202-564-2766

To: Christ, Lisa[Christ.Lisa@epa.gov]; Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]
From: Ellis, Jerry
Sent: Thur 4/16/2015 6:18:50 PM
Subject: PAG materials
PAG Draft Action Memo Water 4-16-15.docx
Internal QandAs Drinking Water PAG 4-16-15.docx
Draft Drinking Water PAG Desk Statement 4-16-15.docx
DRAFT Drinking Water PAG Communications Plan_4-16-15.doc
DRAFT Drinking Water PAG Communications Plan_4-16-15.doc

Here's the:

Draft Action Memo

Desk Statement

Communications Plan

Internal Q&A's

Jerry L. Ellis, Jr.

Environmental Scientist

U.S. Environmental Protection Agency

Standards and Risk Management Division

Office of Ground Water and Drinking Water

1200 Pennsylvania Ave. (4607M), N.W.

Washington, D.C. 20460

Phone: 202-564-2766

To: Christ, Lisa[Christ.Lisa@epa.gov]; Ellis, Jerry[Ellis.Jerry@epa.gov]
From: Hernandez-Quinones, Samuel
Sent: Thur 4/16/2015 5:28:13 PM
Subject: Revised Chapter & FRN Input
DW PAG FRN Input Sam H 4-16-2015.docx
Revised Version 4-16- Draft Chapter Drinking Water PAG V1_SHQ.docx

Attached.

Sam

==

Samuel Hernández Quiñones, P.E.
Environmental Engineer
Environmental Protection Agency
Office of Water
1200 Pennsylvania Ave. NW
Washington, DC 20460
202-564-1735

"USEPA Protecting Human Health and the Environment"

To: Christ, Lisa[Christ.Lisa@epa.gov]
Cc: Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]
From: Ellis, Jerry
Sent: Wed 4/15/2015 9:23:25 PM
Subject: RE: draft Water PAG Action Memo for your input
PAG Action Memo Water 4-1-2015_J.Ellis suggestions.docx

Yes,

Here are my comments on Draft Action Memo. No edits right now to the FRN.

Jerry L. Ellis, Jr.

Environmental Scientist

U.S. Environmental Protection Agency

Standards and Risk Management Division

Office of Ground Water and Drinking Water

1200 Pennsylvania Ave. (4607M), N.W.

Washington, D.C. 20460

Phone: 202-564-2766

From: Christ, Lisa
Sent: Wednesday, April 15, 2015 5:19 PM
To: Ellis, Jerry
Subject: RE: draft Water PAG Action Memo for your input

Hello Jerry – any comments on the memo and/or FRN?

Thanks

Lisa

From: Ellis, Jerry
Sent: Tuesday, April 14, 2015 1:00 PM
To: Christ, Lisa; Hernandez-Quinones, Samuel
Subject: RE: draft Water PAG Action Memo for your input

I will have comments on the action memo.

Jerry L. Ellis, Jr.

Environmental Scientist

U.S. Environmental Protection Agency

Standards and Risk Management Division

Office of Ground Water and Drinking Water

1200 Pennsylvania Ave. (4607M), N.W.

Washington, D.C. 20460

Phone: 202-564-2766

From: Christ, Lisa
Sent: Tuesday, April 14, 2015 7:58 AM
To: Hernandez-Quinones, Samuel; Ellis, Jerry
Subject: RE: draft Water PAG Action Memo for your input

Gentlemen –

I don't think I received any comments from either of you. Did you have any on the action memo?

\We also need to provide comments on the draft FRN. Please send your comments for both documents to me by COB tomorrow.

Thanks-

Lisa

From: Christ, Lisa
Sent: Thursday, April 02, 2015 8:43 AM
To: Hernandez-Quinones, Samuel; Ellis, Jerry
Subject: FW: draft Water PAG Action Memo for your input

Please send your comments to me by COB April 8 and I'll compile our comments and send them forward.

L

From: DeCair, Sara
Sent: Wednesday, April 01, 2015 9:42 AM
To: Veal, Lee; Perrin, Alan; Christ, Lisa; Hernandez-Quinones, Samuel; Ellis, Jerry; Wieder, Jessica
Subject: draft Water PAG Action Memo for your input

Good morning all;

I've retooled our 2013 PAG Manual Action Memo to convey our drinking water proposal from our AAs to OP, to OMB, and then eventually up for signature. This memo will go in the FR package and OP will check all their policy review boxes so it's wise to make sure now that we're on track to do all these things.

Some challenges could be introduced by opening this up for intra-Agency reviews and so I've encouraged our ODs to make contact with their OD counterparts to make them aware of the proposal. Our next stop is OGC, for a full review.

Also, this memo says the proposal is for Stan Meiburg's signature, but yesterday we talked about having Ken Kopocis sign the FR Notice of Availability instead. That might be less onerous to get through the process, and at Tier 4, this type of notice is often signed by the AA level since it is not final or binding in any way.

Thoughts? Thank you!

Sara

Sara D. DeCair

http://www.epa.gov/radiation/rert/pags.html

202-343-9108

new office

Room 1416 B in WJC West

To: Christ, Lisa[Christ.Lisa@epa.gov]
Cc: Ellis, Jerry[Ellis.Jerry@epa.gov]
From: Hernandez-Quinones, Samuel
Sent: Wed 4/15/2015 8:35:41 PM
Subject: Revised PAG Chapter
Revised Version 4-14- Draft Chapter Drinking Water PAG V1.docx

Attached.

Sam

==

Samuel Hernández Quiñones, P.E.
Environmental Engineer
Environmental Protection Agency
Office of Water
1200 Pennsylvania Ave. NW
Washington, DC 20460
202-564-1735

"USEPA Protecting Human Health and the Environment"

To: Christ, Lisa[Christ.Lisa@epa.gov]
Cc: Veal, Lee[Veal.Lee@epa.gov]; Perrin, Alan[Perrin.Alan@epa.gov]
From: DeCair, Sara
Sent: Mon 4/13/2015 7:42:56 PM
Subject: PAGs project plan check-in
RP_AP-BR1-8_PAG-Manual_(DeCair)v2.docx

Lisa,

Lisa,

Lee and I were talking about getting your feeling on the dates for our next several steps on the drinking water PAG proposal. I know Sam's busy with the proposal edits right now, but maybe you can see if you think the months listed in the attached two page plan are achievable, given some unpredictability noted at the bottom.

When I talked with Jerry last week about Comms materials, we thought our ODs are a good audience for internal Qs and As and the messaging, since they want to feel knowledgable and of course get to guide our next steps forward.

I'll be in my office Tuesday through Thursday this week and Lee will be traveling but available if we need to get on a call together. Thank you for any input you have on the timeline!

Sara 202-343-9108

To: Veal, Lee[Veal.Lee@epa.gov]; Christ, Lisa[Christ.Lisa@epa.gov]; Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]; Ellis, Jerry[Ellis.Jerry@epa.gov]; Wieder, Jessica[Wieder.Jessica@epa.gov]
From: DeCair, Sara
Sent: Mon 4/6/2015 9:48:11 PM
Subject: draft FR Notice for water PAG proposal
Water PAG FR Notice draft 4-6-2015.docx

All;

We're not ready to put the FR package together quite yet but are getting all the pieces written while finished EPA reviews of the drinking water PAG proposal.

The attached draft would announce the PAG for comment and hopefully provides enough context that various user groups can understand what we're trying to do before going to the proposal itself, where rationale, the guidance, and the derived response levels are provided.

The gray shaded parts are standard FR language that is not for editing, but please feel free to give me suggestions on what more can be said to ensure our customers have what they need to provide us thoughtful input.

We will have an edited version of the proposal itself from Sam next week, so you will have more context for this then. (Note I'm not suggesting a date to get comments to me, but when this gets more urgent, you can be sure you'll hear from me.)

Thanks!

Sara

To: Christ, Lisa[Christ.Lisa@epa.gov]
From: Hernandez-Quinones, Samuel
Sent: Thur 4/2/2015 2:56:06 PM
Subject: RE: commenters on the 2013 draft PAG Manual -- DW request for comments
Enviro Stakeholder Comments PAGs.pdf

Hi Lisa,

Please see comments file attached.

Sam

==

Samuel Hernández Quiñones, P.E.
Environmental Engineer
Environmental Protection Agency
Office of Water
1200 Pennsylvania Ave. NW
Washington, DC 20460
202-564-1735

"USEPA Protecting Human Health and the Environment"

From: Christ, Lisa
Sent: Thursday, April 02, 2015 9:50 AM
To: Hernandez-Quinones, Samuel
Subject: FW: commenters on the 2013 draft PAG Manual -- DW request for comments

Please send me this today.

Thanks-

Lisa

From: Christ, Lisa
Sent: Wednesday, April 01, 2015 8:59 AM
To: Hernandez-Quinones, Samuel
Cc: Ellis, Jerry
Subject: commenters on the 2013 draft PAG Manual -- DW request for comments

Hi Sam –

Please provide any comments received from the following people/groups:

John Rachow, PhD MD. University of Iowa College of Medicine, and Board member of Physicians for Social Responsibility (PSR)

Susan Hito Shapiro, JD. Board member of Radiation and Public Health Project, and leadership council of the Indian Point Safe Energy Association

Diane D'Arrigo. Radioactive Waste Project Director, Nuclear Information and Resource Service (NIRS)

Michelle Gin. Graduate Student at University of Minnesota School of Public Health and National Student Coordinator for Physicians for Social Responsibility (PSR)

Cindy Folkers. Radiation and Health Specialist, Beyond Nuclear

Alfred Meyer. Chair Radiation and Health Committee and Board member of Physicians for Social Responsibility (PSR)

They've requested a meeting on a number of different radiation issues and I want to see what comments, if any, they provided. Please send me their comments COB today.

Thanks -

Lisa

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Lisa Christ, Chief

Targeting and Analysis Branch

Office of Ground Water and Drinking Water

USEPA

1200 Pennsylvania Ave NW
Washington, DC 20460-0001
phone: 202.564.8354
fax: 202.564-3760

Mail Code: 4607M
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

September 16, 2013

The Honorable Gina McCarthy
Administrator
U.S. Environmental Protection Agency
Aricl Rios Building
1200 Pennsylvania Ave., N.W.
Washington, DC 20460
McCarthy.gina@Epa.gov

US EPA Air and Radiation Docket and Information Center
Mail Code: 6102T, 1200 Pennsylvania Ave NW, Washington, DC 20460
a-and-r-docket@epa.gov; *www.regulations.gov*

Re: Protective Action Guides for Radionuclides (Docket ID No. EPA–HQ–OAR–2007–0268)

Dear Administrator McCarthy:

We write to express our concern about and opposition to key aspects of the revised Protective Action Guides (PAGs) for responding to releases of radioactivity. PAGs identify radiation doses that are to trigger actions to protect the public so as to avoid public exposures in excess of those doses. As such, the PAGs are critical for public protection; weak PAGs can significantly endanger the public.

On 15 April 2013 the Agency published in the *Federal Register* a request for public comment on the proposed PAG revisions; 78 FR 22257-60. Simultaneously, however, EPA made the new PAGs immediately effective, raising questions about whether the public comment opportunity is *pro forma* or serious.

Nonetheless, we respectfully submit this delineation of significant problems in the PAGs. Many of our organizations opposed efforts by EPA in the last days of the George W. Bush Administration to issue PAGs that would have substantially weakened radiation protections for the public by, for example, increasing dramatically the amount of radioactivity permitted in drinking water and in soil. We were gratified when the Obama Administration in its first days in office withdrew the Bush-era PAG proposal and promised a thorough review.

The current Obama PAGs now issued are in many respects as troubling as the Bush proposal, and in some particulars, even weaker in terms of public health protection. Some cosmetic changes have been made—e.g. vaguer language is used which may have the same disturbing effect. But at their core, rather than specifying protective actions to prevent public exposures, the PAGs would allow massive radiation exposures without any protective actions being recommended to limit them. We recommend the PAGs be withdrawn.

Our primary concerns are: (1) the proposal to allow, for one to several years after a release, radioactive contamination of drinking water at levels orders of magnitude above EPA's longstanding Safe Drinking Water Act (SDWA) limits, (2) language contemplating long-term cleanup standards vastly less protective than EPA's historically acceptable risk range, (3) the elimination of relocation PAGs for high thyroid and skin doses and for high projected cumulative whole body doses, (4) the recommendation to permit radioactive waste to be disposed of in unlicensed disposal sites, including regular municipal garbage dumps, (5) the inappropriate expansion of the PAGs to cover essentially all radioactive releases, from the most extraordinary (e.g. nuclear weapons explosions) to those far less consequential (e.g. transportation accidents involving relatively small amounts of radioactivity), (6) relying on PAG dose limits as high or higher than those in effect decades ago despite the fact that official estimates of cancer risks from radiation have increased significantly over that period, and (7) apparently un-reviewed retention of archaic and extremely high FDA food contamination guidelines.

Background

During the George W. Bush Administration, the Department of Homeland Security (DHS) issued PAGs for responding to the use by a terrorist group of an Improvised Nuclear Device (IND) or a "dirty bomb," a Radiological Dispersal Device (RDD). The DHS PAGs were very controversial. Many of us joined in critical comments.[1]

The DHS PAGs recommended not setting any standard for long-term cleanup but rather adopted a vague process called "optimization" in which the economic interest in not spending money on cleanup could outweigh the public health need to do so. No health-based standard would be established in advance in the PAGs, so decisions about how much to clean up would be made after the fact, selecting from various contradictory "benchmarks" from national or international advisory committees. Those entities are often heavily dominated by nuclear interests and have pressed for not requiring cleanup until doses reach extraordinary levels.

One of the benchmarks considered was *to not undertake cleanup* if the dose to the public were less than 1 rem (1000 mrem) per year (the equivalent of approximately 15,000 chest X-rays over thirty years) and *to only require cleanup over 10 rem per year* (roughly 150,000 chest X-rays over the same period), with discretion to not undertake cleanup when exposures are between those two doses.[2] According to the EPA's own current risk estimates per unit dose in its most recent "Blue Book,"[3] derived from the National Academy of Sciences' Report on the Biological

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[1] See, e.g., group comment letter of 14 April 2006 and letters to then-EPA Administrator Leavitt of 2 December 2004 and 27 January 2005, attachments found, beginning at pg. 155, at http://committeetobridgethegap.org/wp-content/uploads/2013/04/080509LetterToEPAbr5.pdf and incorporated herein by reference.

[2] The adult dose from a PA (posterior-anterior or front) view chest X-ray is typically 2 millirem.

[3] *EPA Radiogenic Cancer Risk Models and Projections for the U.S. Population,* EPA 402-R-11-001, April 2011. The Blue Book sets the excess cancer risk at an age- and sex-averaged value of 1.16×10^{-1} per Gray, with the first 30 years of life the risk being approximately 1.8 times higher. EPA standard practice when one doesn't consider lifetime exposure is to presume exposure over the first 30 years of life for residential scenarios and over the first 40 years for farmer scenarios.

Effects of Ionizing Radiation (BEIR VII), 1 rem per year over the first thirty years of life would result is an excess cancer in every 17th person exposed.[4] At 10 rem/year, EPA's own estimate is that one in every 1.7 people exposed would get a cancer from the radiation.[5] Allowing such high numbers of cancers to be produced from exposure to contamination would obviously be orders of magnitude beyond risks EPA has ever considered acceptable.

The DHS PAGs also recommended allowing radioactive contamination of drinking water at levels far higher than the SDWA allows.[6] Despite the substantial public opposition, the Bush Administration adopted the DHS PAGs.

Subsequent to the issuance of the DHS PAGs, EPA attempted to extend these weakened standards from terrorist events to non-terrorist events and indeed, to all radiological releases. In the EPA proposed PAGs, "optimization" was included for long-term cleanup and actual radionuclide concentrations were put forward for drinking water. Those drinking water levels were orders of magnitude higher than EPA's Safe Drinking Water Act. For some radionuclides, EPA was proposing to allow people to drink water contaminated to such a high level that drinking a single small glass would exceed a lifetime permitted consumption under the SDWA, according to internal EPA analyses obtained under the Freedom of Information Act.[7] Independent analyses confirmed this, showing that the proposed drinking water levels were, depending on the radionuclide, hundreds, thousands, tens of thousands, and hundreds of thousands of times higher than the SDWA limits.[8]

The EPA PAGs that the outgoing Bush Administration tried to publish in its last days in office also would have adopted the deeply troubling DHS "optimization" process for long-term cleanup. Furthermore, the applicability of the PAGs would have been extended to *all* radioactive releases.

Recognizing the highly problematic aspects of these proposals by the outgoing Administration, the Obama Administration withdrew them and promised a full and careful review. We were thus hopeful that when new PAGs were released, they would be truly protective. We have been deeply disappointed.

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[4] 1 rem/year x 30 years x 2 x 10-3 cancers per rem during the first 30 years = 6 x 10-2 cancers = 1 cancer per 17 people exposed.

[5] These are gender-averaged risk figures. Females are at even greater risk than males from the same levels of exposure meaning their risks are even higher than these estimates.

[6] The DHS PAGs recommended a high dose level for radiation from drinking water but did not provide specific concentrations for individual radionuclides.

[7] http://www.peer.org/news/news-releases/2010/04/05/radiation-exposure-debate-rages-inside-epa/

[8] See Hirsch and Marx, *Proposed Relaxation of EPA Drinking Water Standards for Radioactivity,* Committee to Bridge the Gap, October 2008, found as an attachment to the URL identified in footnote 1 above and incorporated herein by reference.

1. <u>The PAGs Propose Allowing Radioactive Contamination of Drinking Water That Would Be Orders of Magnitude Higher than EPA's Longstanding Safe Drinking Water Act Limits</u>

The Bush Administration PAGs presented a table of concentrations for specific radionuclides that it proposed would be allowed without requiring treatment or alternative water sources. These concentrations were grossly higher than the levels permitted under the SDWA. The furor they provoked contributed to the Obama Administration withdrawing the proposal.

However, rather than rejecting the Bush Administration approach, the new PAGs issued by EPA adopt a similar tack—proposing abandoning the SDWA requirements and replacing them with considerably higher values. But unlike the Bush PAGs, which expressly included a table of the extreme concentrations proposed for each radionuclide, the new PAGs bury the proposed alternatives in footnotes. (Footnotes 24-27 on p. 42). The actual values for the alternatives are not even included, only citations to other works. No comparison is provided whatsoever as to how much each of these proposed alternatives would weaken the protections in the SDWA.

We have thus undertaken that missing analysis. The results are striking and are summarized in the tables below. The first shows, for four key radionuclides, the EPA Safe Drinking Water Act limits (in becquerels per liter, bq/L) compared with the alternatives now proposed by EPA in the new PAGS, as well the values previously proposed by the Bush Administration. One sees the extraordinary weakening of protections EPA now proposes.

Obama Drinking Water PAG proposals vs. Existing EPA Safe Drinking Water Levels and Bush Administration PAG Proposal
units = Bq/L

Radionuclide	EPA Safe Drinking Water Act Maximum Contaminant Limit (MCL)	**Bush Proposed Drinking Water PAG**	**Obama Proposed Drinking Water PAG Alternative I** (EPA 2013 fn 26)	**Obama Proposed Drinking Water PAG Alternative II** (EPA 2013 PAG fn 25)	**Obama Proposed Drinking Water PAG Alternative III** (EPA 2013 PAG fn 27)	**Obama Proposed Drinking Water Alternative IV** (EPA 2013 PAG fn 24a)	**Obama Proposed Drinking Water Alternative V** (EPA 2013 PAG fn 24b)
Iodine-131	0.111	314	314	3000	170	10	300
Strontium-90	0.296	246	246	200	160	10	
Cesium-137	7.4	503	503	2000	1200	10	
Plutonium-239	0.555	27	27	50	2	1	

The second table shows how many times more radioactivity would be permitted in drinking water under the various alternatives compared to the SDWA limits. The extraordinary degree to which EPA proposes increasing permissible concentrations of radionuclides in drinking water is also shown in graphs attached to this letter.

Factors by Which Obama Drinking Water PAG Proposals Would Exceed Existing EPA Safe Drinking Water Levels

Radionuclide	Bush Proposed Drinking Water PAG	Obama Proposed Drinking Water PAG Alternative I (EPA 2013 fn 26)	Obama Proposed Drinking Water PAG Alternative II (EPA 2013 PAG fn 25)	Obama Proposed Drinking Water PAG Alternative III (EPA 2013 PAG fn 27)	Obama Proposed Drinking Water PAG Alternative IV (EPA 2013 PAG fn 24a)	Obama Proposed Drinking Water PAG Alternative V (EPA 2013 PAG fn 24b)
Iodine-131	2829	2829	27027	1532	90	2703
Strontium-90	828	828	676	541	34	
Cesium-137	68	68	270	162	1.35	
Plutonium-239	49	49	90	3.6	1.8	

It makes no sense to require people to drink water with, for example, more than 800 times the concentration of strontium-90 than the levels EPA has historically permitted, or thousands or even tens of thousands of times the permissible iodine-131 levels.[9] We oppose any weakening of drinking water standards for radioactivity. The SDWA limits should be complied with.

We note that the water PAGs are not designed for the immediate, early phase after a release, when actions to protect water supplies might arguably be difficult. Instead, the water PAGs are for the intermediate phase, after the emergency has passed, and are to be in place for one to several years after the emergency. Surely the position of EPA should be that drinking water for such a long period should be protected at levels EPA has deemed acceptable under the Safe Drinking Water Act.

Rather than proposing to force people to drink water contaminated at levels hundreds, thousands, or even tens of thousands of times higher than the EPA has historically considered acceptable under the Safe Drinking Water Act, the PAGs should instead do what they are supposed to do: provide protective action guidance for authorities on how to treat contaminated water or provide alternative drinking water supplies after the immediate emergency has passed. This is, of course, what EPA has historically done in the wake of other emergencies—arranged for treatment or alternative water supplies.

We recommend EPA abandon all efforts to set water PAGs that are weaker than the Safe Drinking Water Act limits, and instead, provide real, concrete guidance to authorities on how to safeguard water supplies so as to protect the public.

[9] EPA has tried to defend these proposals to dramatically increase allowable radioactivity concentrations in drinking water by asserting that the SDWA limits are "based" on a 70-year lifetime exposure. That is not really true. Under SDWA, drinking water is not to contain radionuclides at concentrations above the Maximum Contaminant Limit (MCL) averaged *over a year*. (Even were that not the case, most of the new values proposed are not seventy times higher than MCLs, but hundreds or thousands of times higher). Similarly, the claim that it is appropriate to allow far higher levels of a radionuclide like I-131 because it is relatively short-lived is misdirected. Under SDWA, as indicated above, one already can average the concentration over a year. There is no need to breach the SDWA.

2. The PAGs Propose Dramatically Relaxing EPA's Long-Term Cleanup Requirements

EPA has historically required even the nation's most contaminated sites to be cleaned up to a level deemed protective, defined as within EPA's long-held acceptable risk range, which aims for a risk level of one in a million (10^{-6} risk) but allowing no more than one in 10,000 people exposed to get cancer (a 10^{-4} risk) from that exposure. EPA has thus established Preliminary Remediation Goals (PRGs) for both radionuclides[10] and hazardous chemicals[11] and a flexible process by which, if unusual circumstances make reaching the PRGs difficult, less protective standards can be adopted so long as they are within the risk range. These risk levels have been accepted as reasonable for even huge, heavily contaminated Superfund sites (e.g. Hanford) that are half the size of a state, and thus should not be relaxed in the PAGs. The main reason for the reduction in protection is to save money and liability for industries and agencies that carry out practices that could result in large radioactive contamination, mainly the nuclear power industry and the atomic weapons fuel chain agencies and their contractors.

EPA now proposes in the PAGs that this long-followed protective approach and acceptable risk range be jettisoned and that extraordinarily higher concentrations of radionuclides be allowed to remain in soil for the long-term with no effort at cleanup. While not using the controversial term "optimization" from the Bush-era proposed PAGs, language in the PAGs could permit some to say that EPA now merely proposes optimization without calling it that. No risk-based cleanup standards for long-term cleanup would be established in the PAGs, even as a baseline, but rather a vague, undeveloped, makeshift process would be followed whereby cleanup standards would be established after the fact, based on factors other than public health. For example, the PAGs contemplate letting the desire of industry or federal agencies to not have to pay for cleaning up contamination they have created by a release override the public's need to be protected. This is unacceptable.

Just as EPA tried to relegate the proposed weakening of drinking water standards to footnotes, EPA also appears to be trying to weaken long-term cleanup standards by vague references to the DHS 2008 PAGs and by cooperating with an outside group with strong nuclear ties, the National Council on Radiation Protection and Measurements (NCRP) which recommends grossly weakened cleanup guidelines via an NCRP guidance document.

Especially troubling is the process by which EPA chose to pursue the path of weakening long-term protection of the public. For example, two EPA staffers from relevant EPA Offices[12]

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[10] http://epa-prgs.ornl.gov/radionuclides/

[11] http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/index.htm
These regional values are used nationally.

[12] John Edwards, head of the radiation protection division of the Office of Radiation and Indoor Air, and John Cardarelli from the Office of Emergency Management. EPA claims they participated with NCRP on their own but has not provided evidence that they took time off and that the activity was not approved by their superiors at EPA.

influential in developing the EPA PAGs participated in writing the NCRP guidance document which presses EPA to weaken, to an extraordinary degree, its long-term cleanup standards. This is significant because EPA staff from other Offices attempting to retain existing radiation protection levels were not included on the NCRP team. This internal EPA conflict and the apparent conflict of interest in EPA staff participating at all in the private NCRP effort at pushing EPA to relax its cleanup goals, while representing only one side of the internal EPA debate, has been reported on in the media, pursued via Freedom of Information Act requests and a letter from Public Employees for Environmental Accountability to then-EPA Administrator Jackson[13] but EPA has failed to respond meaningfully.

The EPA PAGs DO NOT incorporate the full DHS PAGs on long-term cleanup, only a subsection dealing with general process matters about consultation (reprinted in section 4.1.6 of the EPA PAGs, pp. 55-59). The DHS PAGs sections on "optimization" and use of benchmarks for long-term cleanup are *not* included in the EPA PAGs. However, a single sentence elsewhere in the EPA PAGs (p. 4, para 4), mentions incorporation of guidance from DHS PAGs' long-term cleanup section, presumably referring to the subsection that is inserted. This poorly crafted sentence, if not clarified, can create subsequent confusion as to whether EPA is incorporating all of the DHS PAGs on long-term cleanup or only the generally innocuous section that is in fact incorporated directly. Since the DHS PAGs are explicitly based on "optimization," and the EPA PAGs are not, and since the DHS PAGs reference "benchmarks" from nuclear advocacy groups like ICRP, NCRP, and IAEA, which have pushed for "acceptable" long-term doses as high as 10 rem per year, with consequent cancer risks as high as 1 cancer per 2 people exposed, whereas the EPA PAGs do not, this potential confusion must be eliminated.

EPA should remove any implication from its PAGs that it is incorporating the DHS PAGs' "optimization" plan and contemplated use of "benchmarks." We recommend that the sentence on p. 4 be rewritten to state, "This EPA Manual substantively incorporates in Section 4.1.6 (pp.55-59) a specific subsection of the late phase cleanup guidance provided in the 2008 DHS document and refers readers to additional planning resources."

The NCRP report--which claims it is designed to provide guidance for both the DHS and EPA PAGs--recommends long-term cleanup standards of 100 to 2000 millirem per year (0.1 to 2 rem per year). That is the equivalent of 50 to 1000 chest X-rays annually, or one a week to three a day every day of one's life for decades. By EPA's own cancer risk estimates, 2 rem per year over a lifetime would result in an excess cancer in one in every six people exposed. Because of the increased risk in earlier years, EPA estimates that even just thirty years exposure from birth would result in a cancer in one in eight people exposed.[14] These risk levels are orders of magnitude higher than EPA's long-accepted risk range.

Additionally, NCRP proposes specific levels of radionuclides that should be allowed to remain in soil and not cleaned up, with people exposed for decades to that radiation without protective actions having been undertaken. Those levels are extraordinarily higher than EPA's

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[13] http://www.nti.org/gsn/article/epa-withholds-information-dirty-bomb-report-amid-cancer-concerns/; http://www.peer.org/assets/docs/epa/4_5_10_PEER_Radiation_ltr_to_EPA.pdf

[14] See footnote 3 above.

Preliminary Remediation Goals (PRGs), or even the upper limit of EPA's acceptable residual contamination (one hundred times the PRG). We have attached tables and figures showing the extreme exposures these proposals would produce compared to anything EPA has ever said in the past was acceptable. For some radionuclides, the NCRP proposed "acceptable" contamination levels would be hundreds of thousands or even millions of times higher than what EPA's remediation goals are at the nation's most contaminated sites, for the same exposure scenario.

We thus oppose the long-term cleanup section of the EPA PAG as written, and any potential linkage of the EPA PAG to DHS' PAGs' "optimization" process and/or to the NCRP recommendations or those of other bodies that push for increased radiation exposures of the public.[15] EPA should stick to its longstanding principles and require cleanup to its standards for the most contaminated sites in the country, CERCLA. In extraordinary circumstances, there are already provisions whereby one can make an exception if one absolutely has to, but even then one still aims to get as close to the CERCLA risk range as possible. The PAGs as written, however, suggest a concerted attack by proponents of weakening public protections, and this should not be allowed.

3. <u>The Elimination of Relocation PAGs for High Thyroid and Skin Doses and for High Projected Cumulative Whole Body Doses</u>

EPA's 1992 PAGs, which the current document revises, require relocation if thyroid or skin doses over certain specified limits are predicted. Again, it is important to remember that PAGs are doses that are to be *avoided* by protective actions. The new PAGs eliminate both requirements. We believe that is inadvisable.

EPA claims it is removing the skin and thyroid relocation PAGs to "avoid confusion." This makes no sense. If predicted doses to the skin or thyroid are likely to be very large, one needs to be protecting people by getting them out of harm's way. The fact that some people in some situations may have access to potassium iodide (KI) doesn't obviate the need to relocate those who don't. And KI does nothing to protect against skin cancer; its sole use is aimed at the thyroid.

Additionally, the longstanding PAGs require protective action to assure people do not get exposed to more than 5 rem over 50 years. This has been jettisoned as well. Obviously, if some within EPA are pushing to allow long-term doses as high as 2 rem per year over many decades (60 rem over 30 years, 140 rem over a lifetime), a 5 rem cumulative cap would prevent that. That apparently is behind their desire to eliminate the lifetime cap. The cap should remain and in fact be tightened considerably (see discussion in section 6 below).

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[15] We incorporate herein by reference comments submitted on the NCRP recommendations, found at http://committeetobridgethegap.org/wp-content/uploads/2013/04/ncrp-short-comments-from-multiple-groups.pdf and http://committeetobridgethegap.org/wp-content/uploads/2013/04/CBGNIRSPSRSCFS-updated.pdf

4. <u>The Recommendation to Permit Radioactive Waste to Be Disposed of In Unlicensed Disposal Sites, Including Regular Municipal Garbage Dumps</u>

Nuclear advocates have long pushed to deregulate significant portions of the radioactive waste stream and permit such wastes to be disposed of in sites neither licensed nor designed for radioactive materials, including municipal garbage dumps. This has largely been driven by a desire to cut safety corners so as to save money for industry and government.

The PAGs strongly push for elimination of the existing requirements that radioactive waste go to sites licensed and designed for radioactive waste. We oppose such an effort. Again, EPA seems intent on weakening protections. PAGs are supposed to be guides for *protective action*, not an effort to eliminate protections.

The section on waste disposal issues in Chapter 4 of the PAGs, *Guidance for the Late Phase,* appears to have been written with little or no historical knowledge about the widespread public opposition over past decades in the United States to proposals for deregulation, free release, clearance or below-regulatory-concern (BRC) designation of radioactive waste from both nuclear power and weapons facilities. The suggestion to allow nuclear waste into RCRA C and D Hazardous and Solid waste facilities is both cavalier and dangerous. Allowing the waste to go into and contaminate or poison commercial recycling has also been soundly rejected. We oppose sending nuclear waste to facilities that are not specifically licensed for radioactive materials, including but not limited to solid and hazardous landfills, incinerators, processors and recycling facilities.

Some of the reasons to keep nuclear waste out of facilities not specifically licensed for radioactive materials include inevitable leakage, the potential intermixing of radioactive materials with chelating and organic complexing agents that greatly enhance the migration of the radioactivity into groundwater and surface water, risk of fire in a landfill with both radioactive and regular wastes as is currently occurring at the West Lake landfill in Missouri, failure to consider the ability of RCRA facilities to isolate the wastes they are licensed to dispose, shorter institutional control periods, failure to inform and protect workers, and lack of detailed radiation monitoring of air, soil, and water. Recycling radioactively contaminated materials into the consumer metal supply rather than disposing of them in licensed radioactive sites is not acceptable.

EPA should have reviewed the public comments which clearly rejected their previous efforts[16] in the mid 1990's, 2001 and 2003 to allow nuclear waste into solid and hazardous facilities and into recycling to make consumer goods.

EPA gives lip-service to inclusivity in the PAGs, ignoring the reality that deregulating (or never requiring radioactive regulation) of nuclear waste from incidents and releases will

[16] 1996-1998 EPA consideration, publication and rejection of rules to legalize contaminating metal recycling with radioactive metal; 2001 66 Fed Reg 27218 May 16, 2001 to allow mixed waste to go to nuclear waste sites; 2003 ANPR 65120 68 Fed Reg 222, Nov 18, 2003 to consider "non-regulatory approaches" for radioactive waste management.

disproportionately impact people of color and low income communities which is where the solid and hazardous waste facilities frequently are located and where new ones tend to get sited.

We encourage EPA, the other federal agencies and states to focus their efforts on *preventing* nuclear power incidents rather than pushing to relax cleanup and disposal safety requirements.

5. <u>The Inappropriate Expansion of the PAGs to Cover Essentially All Radioactive Releases, from The Most Extraordinary (e.g. Nuclear Weapons Explosions) to Those Far Less Consequential (e.g. Small Transportation Accidents)</u>

The DHS PAGs mixed the absolutely extraordinary event—detonation by a terrorist of a nuclear weapon in the U.S.—with vastly less consequential events involving "dirty bombs" of a range of sizes, including very small ones. It was inappropriate to suggest the same standards for such varying incidents. If a nuclear bomb explodes, all bets are off. If a small dirty bomb is detonated, normal response procedures and cleanup requirements can take care of it. By mixing the huge and the small and requiring the same lax standards, a disservice is being done.

EPA has now greatly compounded that problem by expanding its PAGs from dealing with a catastrophic release from a nuclear power plant meltdown to covering all radioactive releases, including such events as transportation accidents and incidents at radiopharmaceutical facilities.[17] Indeed, under the PAGs definition of its scope—dealing with any radioactive release for which a protective action may be required—it is hard to see what might not be covered or how CERCLA, which is EPA's longstanding statutory program for dealing with such releases would still exist, despite *pro forma* language in the PAG to the contrary.

By creating a single set of standards to address both a Fukushima-type event and a truck carrying a shipment of medical isotopes that goes off the road, one creates a useless PAG and the prospect of greatly relaxed cleanup and protection standards for many events for which there is no question that current standards and response approaches under CERCLA are fully adequate. We oppose this effort to expand the PAGs to essentially encompass every radioactive release.

6. <u>Relying on PAG Dose Limits As High As Or Higher Than Those In Effect Decades Ago Despite the Fact That Official Estimates of Cancer Risks from Radiation Have Increased Significantly Over That Period</u>

In addition to eliminating some important dose triggers for protective action in the older PAGs, EPA carries forward old limits that have been in place for decades, despite EPA's own official estimates of radiation risk per unit dose having markedly increased during that time. The updated official consensus is that radiation is considerably more harmful than was known when the earlier levels were established. EPA fails to improve protection based on the newer, higher

[17] EPA PAG Manual 2013, page 4 section 1.3.4 "This updated Manual applies PAGs and protective actions to an expanded range of sources of potential radiological releases, include commercial nuclear power facilities, uranium fuel cycle facilities, nuclear weapons facilities, transportation accidents, radiopharmaceutical manufacturer and users, space vehicle launch and reentry, RDDs and INDs."

risk, and in fact allows for reduced protection instead. For example, the 1992 PAG values incorporated into the newest PAG are based on the National Academy of Sciences' BEIR III study (and in fact, go even far further back than that). But BEIR V increased those risk estimates three- or four-fold, and BEIR VII increase those an additional 35%. EPA has adopted those values in its most recent Blue Book. So, despite officially acknowledging that radiation is four or five times more dangerous than assumed when the 1992 PAGs were established, EPA now merely uses the same dose limits without any effort to tighten them by a factor of four or five.

We recommend that all parts of the PAGs that weaken or eliminate existing protections be abandoned, and all dose limits be tightened by at least the increased risk EPA now acknowledges for radiation.

7. The PAGs Incorporate Archaic and Extremely High FDA Food Contamination Guidelines, Apparently Without Updated Review

EPA simply by reference incorporates old FDA guidelines for food contamination. These food radiation exposures would be on top of doses from other exposures (e.g., inhalation, groundshine) adding significantly to cumulative doses to the public. The old FDA guidelines are based on even older guidance, and none of the dose limits have been reduced over time to reflect the increased official risk estimates discussed above.

The old FDA guidance allows—from the food pathway alone—500 millirems exposure per year. This means that the food one eats each day would produce a radiation dose equivalent of a chest X-ray every day. The FDA food guidance limits appear to have no time limit; food contaminated at these levels would be permitted to be consumed over a lifetime. At these dose levels, EPA's risk estimates indicate a lifetime risk of 4×10^{-2}, or every 25th person eating food contaminated at those levels getting a cancer from it. This is simply unacceptable, and EPA should reject any such proposed guidance. At minimum, if EPA really intends to accept such doses, it should be candid with the public and say that those "acceptable" levels, by its own estimate, would produce an excess cancer in 4% of the public. We think that would be a hard sell ethically, and EPA should thus rethink adoption of such extraordinarily lax protection levels.

SUMMARY OF RECOMMENDATIONS

We recommend the April 2013 draft PAGs be withdrawn.

We oppose any weakening of drinking water standards for radioactivity. The Safe Drinking Water Act limits should be complied with. The PAGs should do what they are supposed to do: provide protective action guidance for authorities on how to treat contaminated water or provide alternative drinking water supplies over the one to several years after the immediate emergency has passed. This is, of course, what EPA has historically done in the wake of other emergencies—arranged for treatment or alternative water supplies.

We recommend EPA abandon all efforts to set water PAGs that are weaker than the Safe Drinking Water Act limits, and instead, provide real, concrete guidance to authorities on how to safeguard water supplies so as to protect the public to those levels or better.

The PAGs contemplate letting the desire of nuclear industry and federal agencies to not have to pay for cleaning up contamination they have created by radioactive releases override the public's need to be protected. This is unacceptable.

EPA should remove any implication from its PAGs that it is incorporating into responding to non-terrorist radiological events the Department of Homeland Security PAGs' "optimization" plan and contemplated use of "benchmarks" that would be outside EPA's historical acceptable risk range.

We oppose the long-term cleanup section of the EPA PAG as written, and the potential linkage of the EPA PAG to DHS' PAGs' "optimization" process, and to the NCRP recommendations or those of other bodies that push for increased radiation exposures of the public. EPA should stick to its longstanding principles and require cleanup to its standards for the most contaminated sites in the country, CERCLA. The PAGs as written suggest a concerted attack by proponents of weakening public protections, and this should not be allowed.

Do not remove, but instead retain and strengthen, relocation PAGs for thyroid and skin doses.

Do not remove, in fact EPA should strengthen, the longstanding PAGs that require protective action to assure people do not get exposed to more than 5 rem over 50 years.

The outdated FDA food contamination guidelines should be replaced with markedly lower permissible concentrations of radioactivity in food.

We oppose sending nuclear waste to facilities that are not specifically licensed for radioactive materials including but not limited to solid and hazardous landfills, incinerators, processors and recycling facilities. We encourage EPA, the other federal agencies and states to focus on *preventing* nuclear power incidents rather than weakening protection of the public in case of such releases.

We oppose the effort to expand the PAGs to essentially encompass every radioactive release.

We recommend that all parts of the PAGs that weaken or eliminate existing protections be abandoned, and all dose limits be tightened by at least the increased risk EPA now acknowledges for radiation.

Conclusion

Protective Action Guides are supposed to provide guidance for actions to protect the public from radiation. The current PAGs do the opposite—recommend grossly increased risks to the public without protection. We urge that the PAGs be withdrawn.

Sincerely,

National

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Takoma Park, MD

Mike Ewall, Esq.
Energy Justice Network
Washington, DC

Jonathan Evans
Toxics and Endangered Species Campaign
Center for Biological Diversity
San Francisco, CA

International

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Ontario Clean Air Association OCAA
Kingston, Ontario Canada

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Global Alliance for Incinerator Alternatives
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Kerry Meydam
Durham Environment Watch
Courtice, Ontario Canada

Lynn Howard Ehrle
International Science Oversight Board of the Organic Consumers Association
Plymouth, Michigan

Kimberly Roberson
Fukushima Fallout Awareness Network
California, Washington DC, Japan

* Points of contact for this letter: Daniel Hirsch, dhirsch1@cruzio.com, (831) 336-8003, and Diane D'Arrigo, dianed@nirs.org, (301) 270-6477.

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Southern California Federation of Scientists

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N U K E W A T C H
The Progressive Foundation
Luck, WI

Joni Arends
Concerned Citizens for Nuclear Safety
Santa Fe, NM

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Defenders of the Black Hills
Rapid City, SD

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Allenwood, NJ

Louis A. Zeller
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Glendale Springs, NC

Liz Woodruff
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Idaho

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Redwood Alliance
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Nashville, TN

Sara Barczak
High Risk Energy Choices Program
Southern Alliance for Clean Energy
Knoxville, TN

Sandra Gavutis
C-10 Research & Education Foundation
Newburyport, MA

Steve Brittle
Don't Waste Arizona
Phoenix, AZ

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Clean Water for North Carolina
Asheville and Durham, NC

Judy Treichel
Nevada Nuclear Waste Task Force
Las Vegas, NV

Karen Hadden
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Austin, Texas

Marylia Kelly
Tri-Valley CAREs (Communities Against a Radioactive Environment)
Livermore, California

Kay Cumbow
Citizens for Alternatives to Chemical Contamination
Lake Station, Michigan

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Kathleen Ferris
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Consumers Health Freedom Coalition
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Linda Seeley
Terra Foundation
San Luis Obispo, CA

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People's Action for Clean Energy (PACE)
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Boulder, Colorado

Colorado Coalition for the Prevention of Nuclear War
Denver Colorado

Alliance For A Clean Environment
Dr. Lewis Cuthbert
Pottstown, PA

Alice Slater
Nuclear Age Peace Foundation
New York, NY

Dave Kraft
Nuclear Energy Information Service
Chicago, IL

Barbara O'Neal
Erwin Citizens Awareness Network, Inc.
Erwin, TN

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Citizens' Environmental Coalition
Albany, NY

Br. Senji Kanaeda and Br. Gilberto Perez
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Sharon E. Lewis, Executive Director
Connecticut Coalition for Environmental Justice
Hartford, CT

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Oregon **Physicians for Social Responsibility**
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Citizens Task Force
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Empire State Consumer Project
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Ohio

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Peace Action CNY
Syracuse, NY

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Ecology Party of Florida
Ft. Lauderdale, FL

Aletha
Free Soil Party USA
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Elaine Holder
San Luis Obispo Mothers for Peace
San Luis Obispo, CA

Garry Morgan, Elizabeth Johnson
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Residents Organized For a Safe Environment (ROSE)
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Margaret Sheehan
Project for Energy Accountability
Cambridge, MA

Greg Mello
Los Alamos Study Group
Albuquerque, NM

Gwen Dubois
Chesapeake Physicians for Social Responsibility
Maryland

Dagmar Fabian
Crabshell Alliance
Maryland

Cheryl Johncox
Buckeye Forest Council
Columbus Ohio

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Athens, Ohio

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Coalition on West Valley Nuclear Wastes
East Aurora, NY

Jim Murphy
The Peace Farm
Amarillo, TX

Janet Greenwald
Citizens for Alternatives to Radioactive Dumping
Albuquerque, NM

Jay Sweeney
Green Party of Pennsylvania
Harrisburg, PA

Jim Haber
Nevada Desert Experience
Las Vegas, Nevada

Scott Sklar
The Stella Group, Ltd.
Arlington, VA

Michael J. Keegan
Coalition for a Nuclear Free Great Lakes
Monroc, Michigan

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Connecticut Coalition Against Millstone
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Ocean Beach Organic Food Co-op
San Diego, CA

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GE Stockholders Alliance
Sandy Spring, MD

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Long Branch Environmental Education Center, Big Sandy Mush Creek
Leicester, NC

Peggy and Melodye Pryor
Andrews, TX

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Abalone Alliance Clearinghouse
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Gladys Schmitz, SSND
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Canon City, Colorado

Titus North
Citizen Power, Inc.
Pittsburgh, PA

Tribal Scribal
The Enviro Show WXOJ-LP
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Cheaper, Safer Power
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William Maurer
Cape Downwinders
Falmouth, MA

Liane Casten
Citizens Act to Protect our Water (CAPOW)
Evanston, IL

Mal Chaddock
NoNukesNW.org
Portland, OR

Robin Schneider
Texas Campaign for the Environment
Austin, TX

Notes

As to the water PAGs, please note that EPA's Alternative 1, identified in footnote 26 of the PAG, is for the same high dose limit that was put forward in the Bush EPA PAG. EPA had previously identified in the Bush PAG radionuclide concentrations it claimed were associated with that dose, so we used here those concentrations. Secondly, Alternative 4, the first alternative in footnote 24 of the PAG, is really not a set of proposed water limits for emergencies but a set of weaker standards for normal consumption of drinking water and not really relevant to the PAG discussion. Lastly, Alternative 5, the second reference in PAG footnote 24, provides a value for only one radionuclide, iodine-131.

The NCRP's suggested long-term cleanup levels are found in NCRP SC 5-1 Draft Report, "Decision Making for Late-Phase Recovery from Nuclear or Radiological Incidents," February 25, 2013, National Council on Radiation Protection and Measurements.

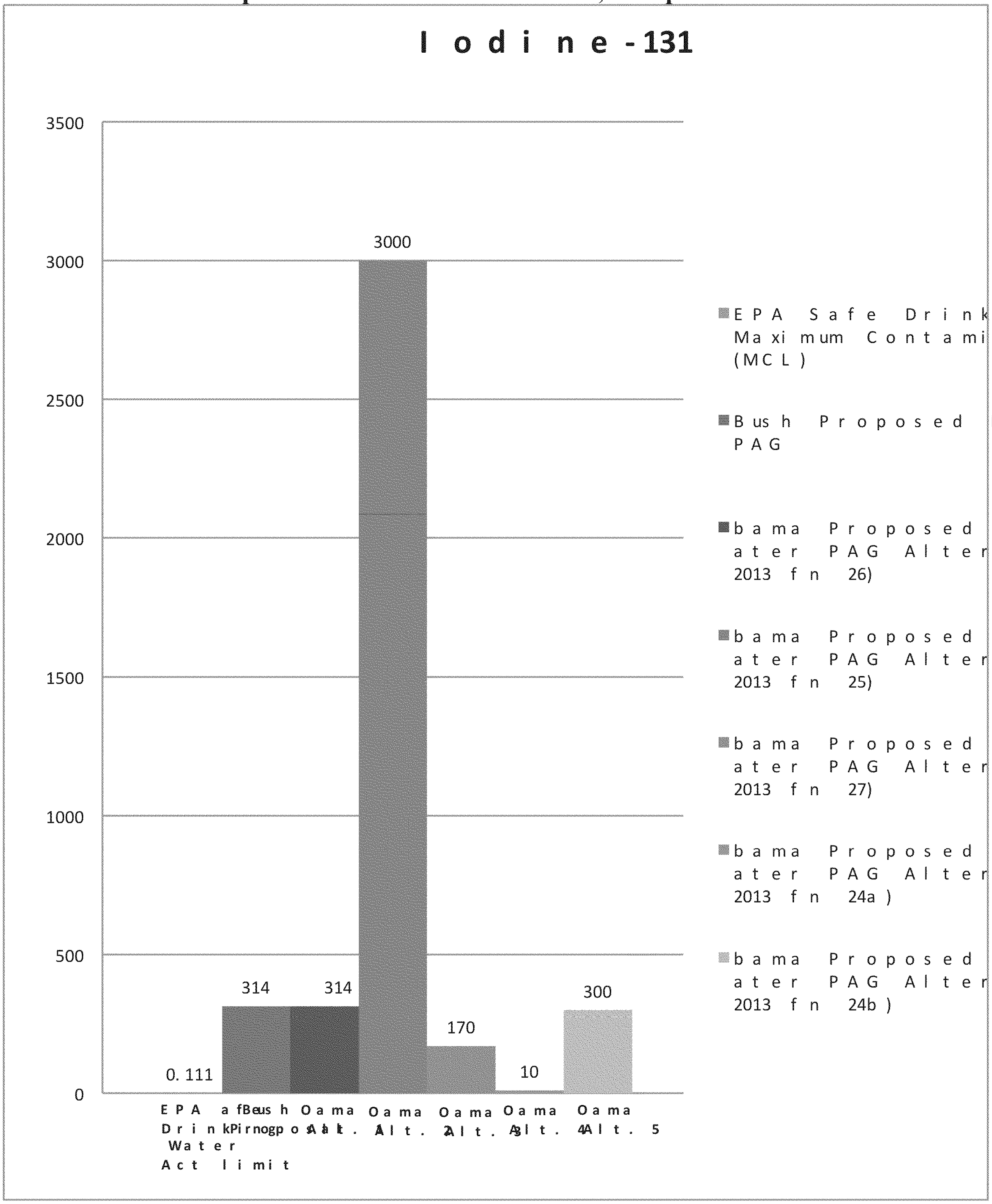
Table 6.4 of the report identifies levels of contamination below which no cleanup would occur based on a 1 mSv/yr dose, for resident farmer, urban resident, and industrial/commercial exposure pathways, and for 95th and 50th confidence intervals. The NCRP report recommends cleanup choices based on a dose range of 1 mSv/yr to 20 mSv/yr (100 mrem to 2000 mrem/yr) and indicates that one just scale up the values in Table 6.4, which are based on 1mSv/yr, to be obtain the concentrations for the 20 mSv/yr limit.

We have taken the NCRP values and compared them to EPA's Preliminary Remediation Goals (PRGs) for the same exposure scenarios—resident farmer and urban resident. We have compared the EPA PRGs to both the 50th and 95th confidence levels concentrations identified by the NCRP report.

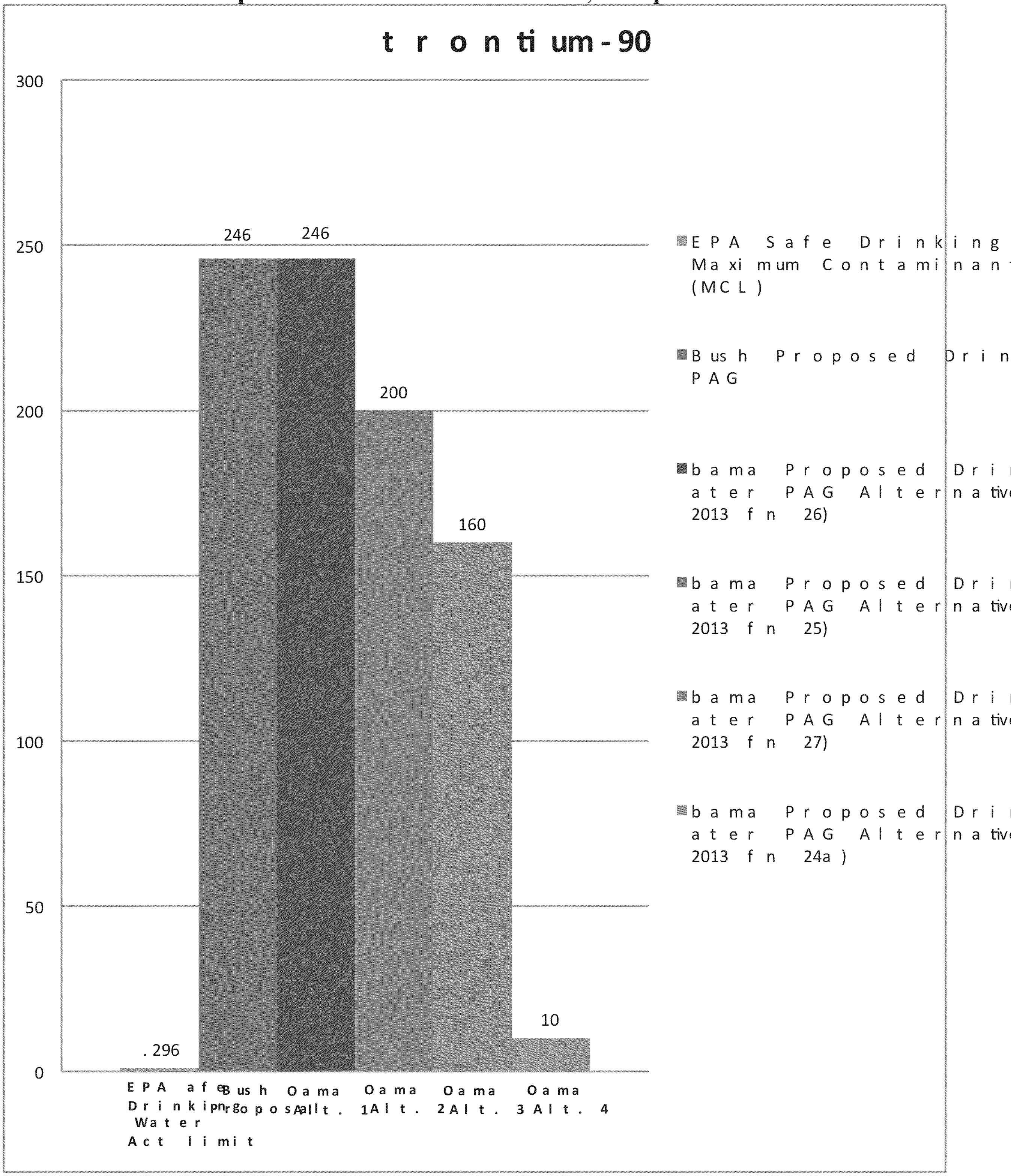
It should be noted that EPA PRGs are the remediation goals, and that in unusual circumstances where one can't meet the goal one can fall back from them, but no more than by two orders of magnitude. In other words, EPA's remediation levels are a range of the PRG to no more than 100 times the PRG. Thus, at the upper end of the NCRP proposed acceptable risk range, for example, for a resident farmer and a 50% confidence interval, NCRP proposed plutonium-239 levels nearly 12 million times higher than EPA's PRG for the same scenario. That would be 120,000 times higher than the upper limit of EPA's risk range.

We gratefully acknowledge the work of Ryan Forster in producing the graphs.

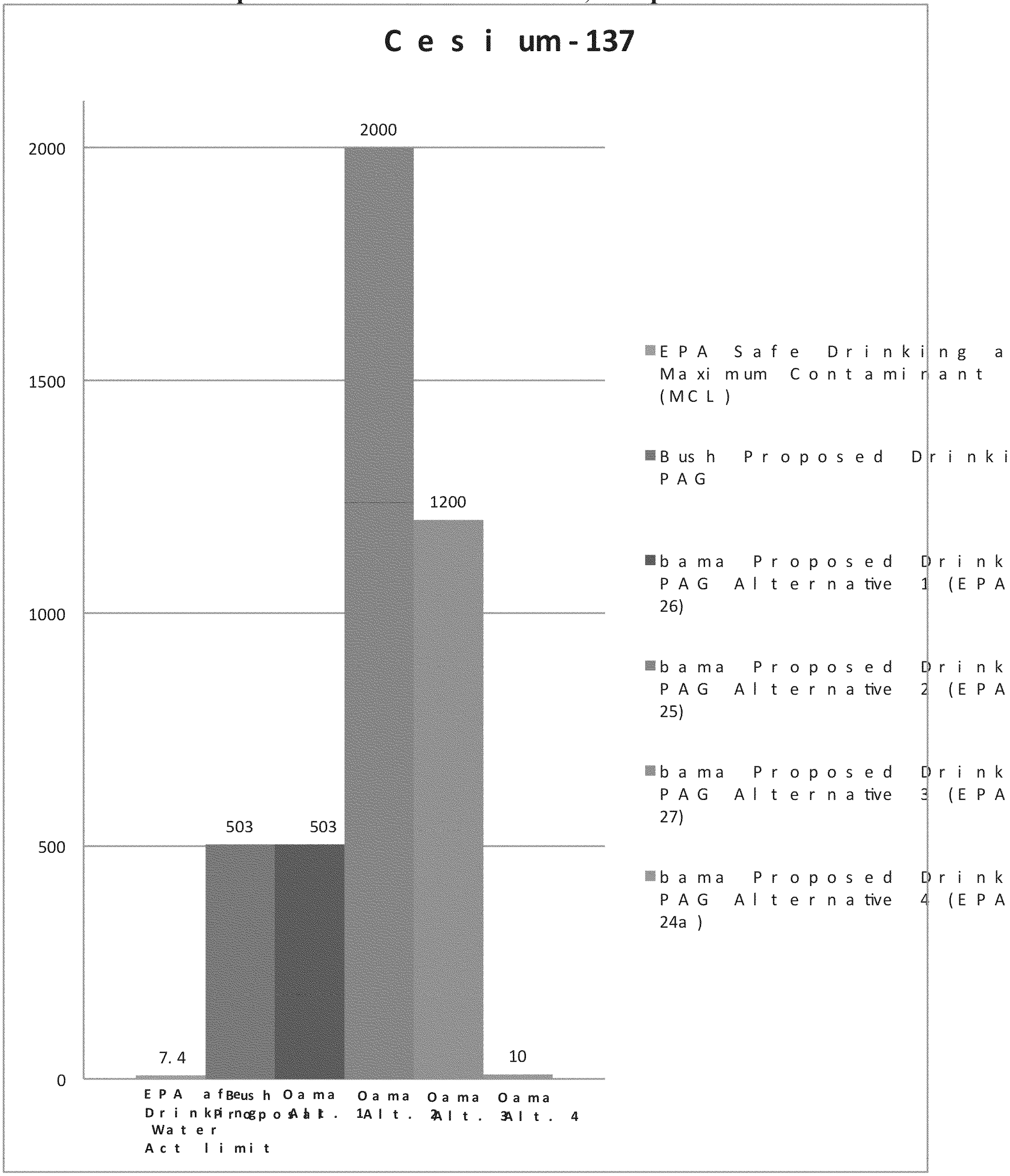
Allowable Radionuclide Concentrations in Water Under the EPA's Safe Drinking Water Act Limits Compared with Alternatives Identified in Proposed Protective Action Guides, in Bq/L



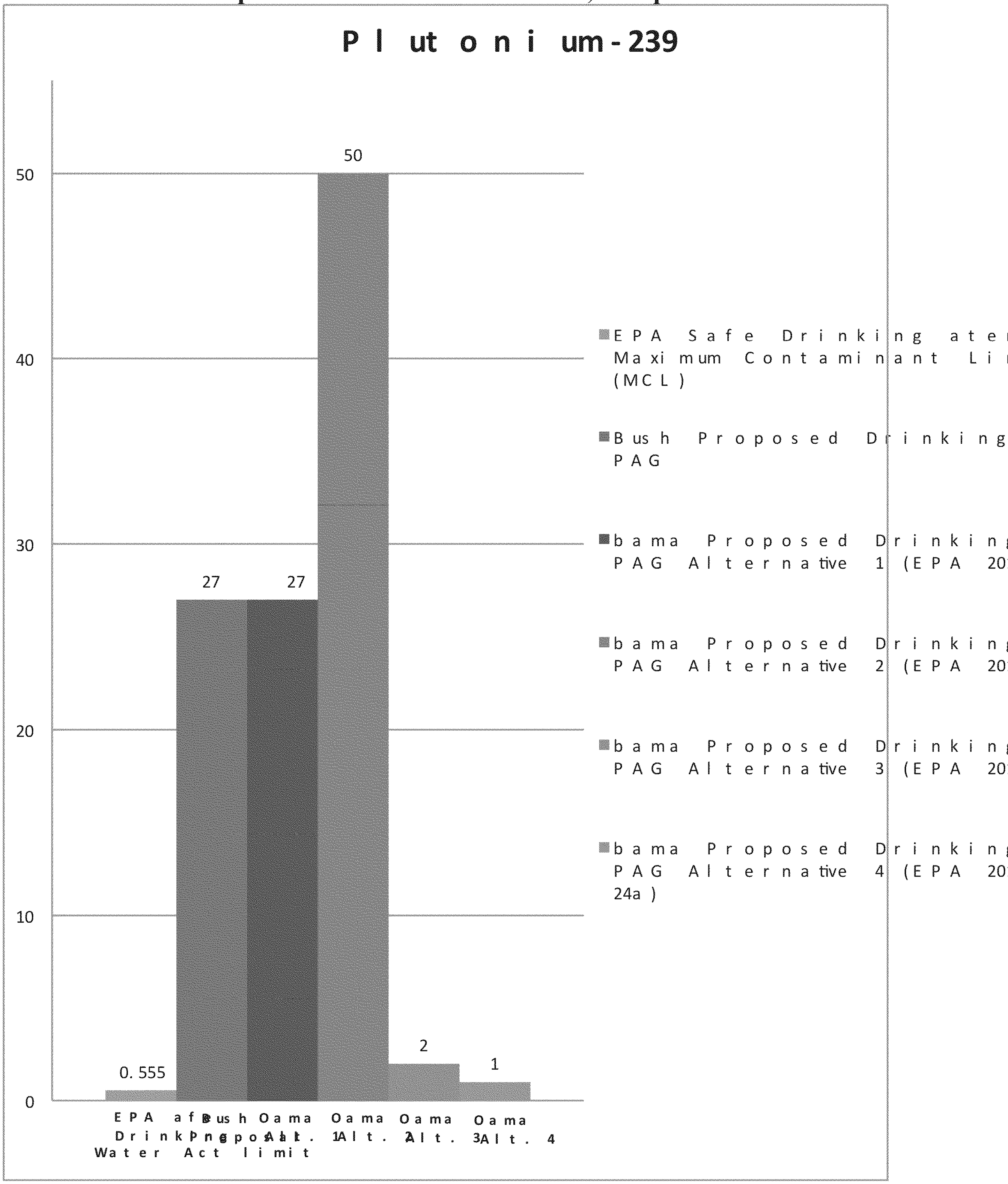
Allowable Radionuclide Concentrations in Water Under the EPA's Safe Drinking Water Act Limits Compared with Alternatives Identified in Proposed Protective Action Guides, in Bq/L



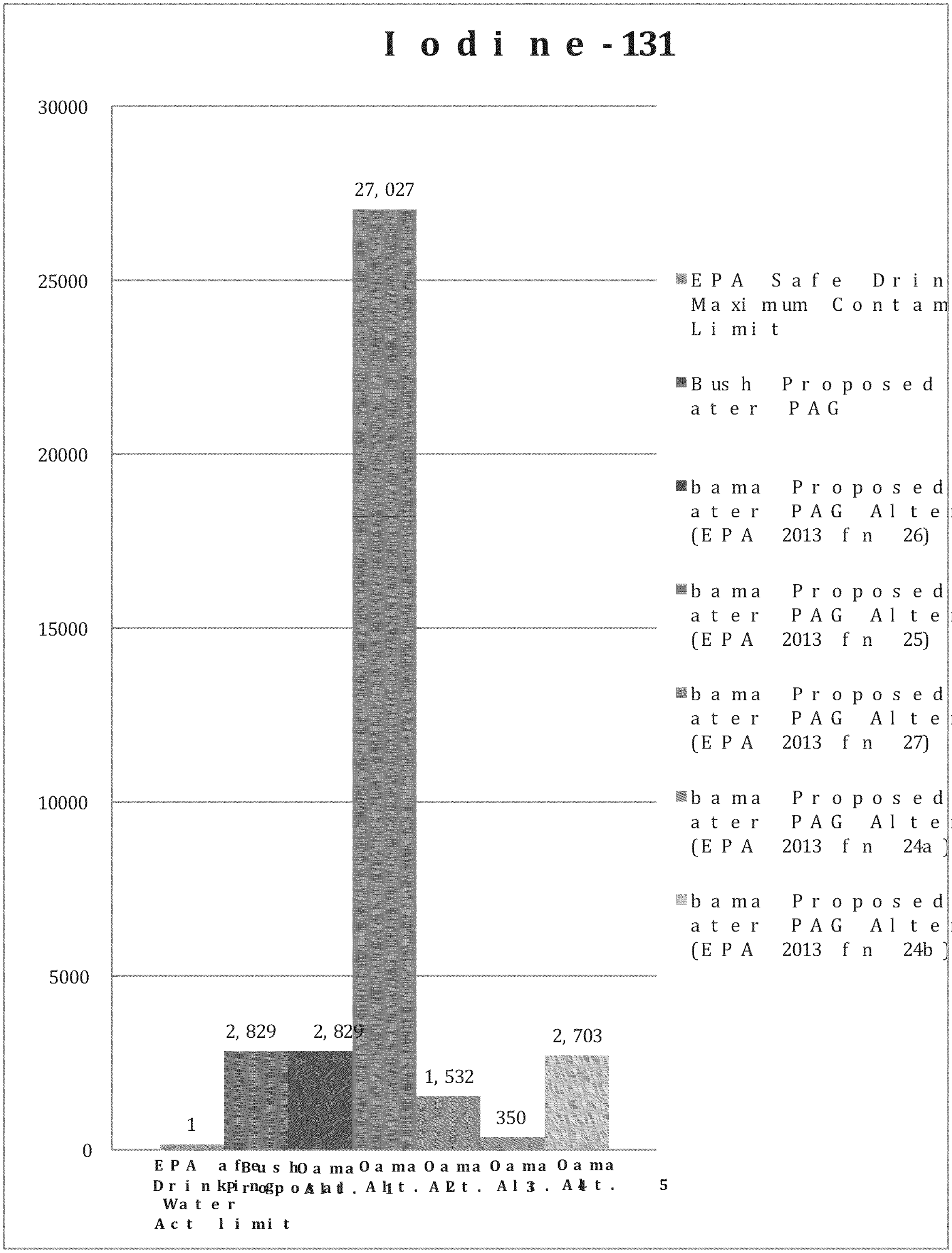
Allowable Radionuclide Concentrations in Water Under the EPA's Safe Drinking Water Act Limits Compared with Alternatives Identified in Proposed Protective Action Guides, in Bq/L



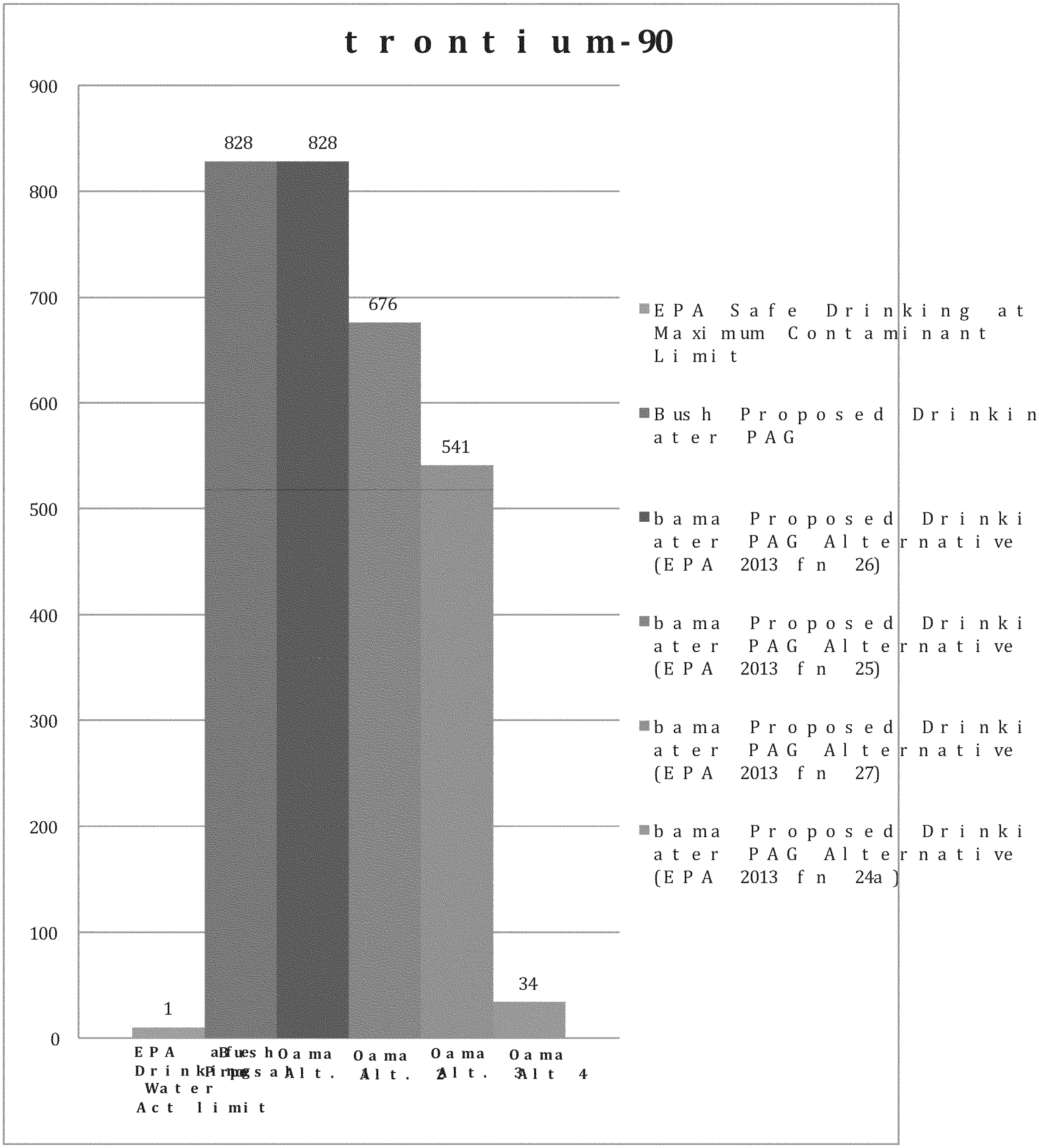
Allowable Radionuclide Concentrations in Water Under the EPA's Safe Drinking Water Act Limits Compared with Alternatives Identified in Proposed Protective Action Guides, in Bq/L



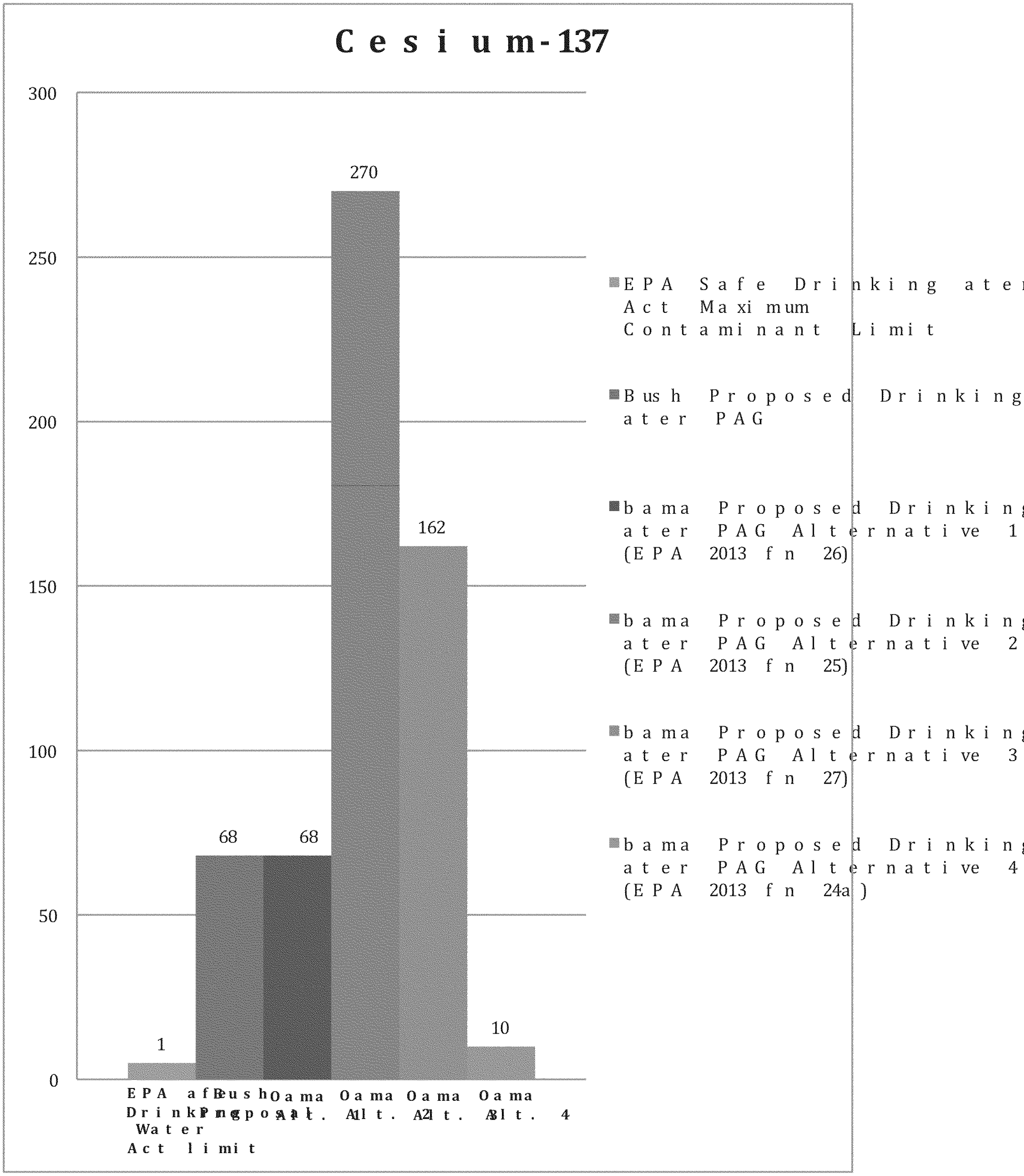
Factors by Which Radionuclide Concentrations in Drinking Water Would Exceed EPA's Safe Drinking Water Act Levels if the Alternatives Identified in 2013 Proposed Protective Actions Guides Were Adopted



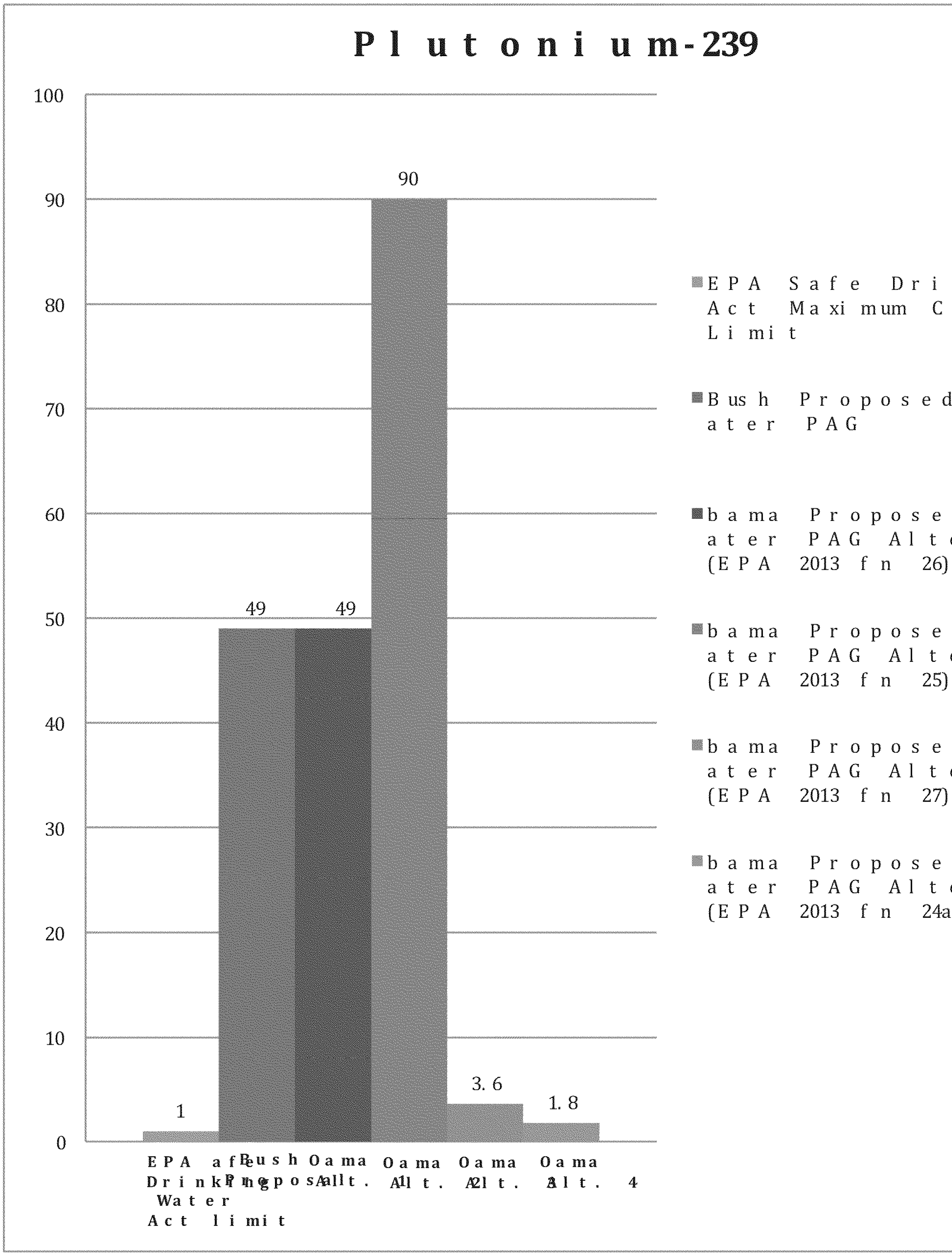
Factors by Which Radionuclide Concentrations in Drinking Water Would Exceed EPA's Safe Drinking Water Act Levels if the Alternatives Identified in 2013 Proposed Protective Actions Guides Were Adopted



Factors by Which Radionuclide Concentrations in Drinking Water Would Exceed EPA's Safe Drinking Water Act Levels if the Alternatives Identified in 2013 Proposed Protective Actions Guides Were Adopted



Factors by Which Radionuclide Concentrations in Drinking Water Would Exceed EPA's Safe Drinking Water Act Levels if the Alternatives Identified in 2013 Proposed Protective Actions Guides Were Adopted



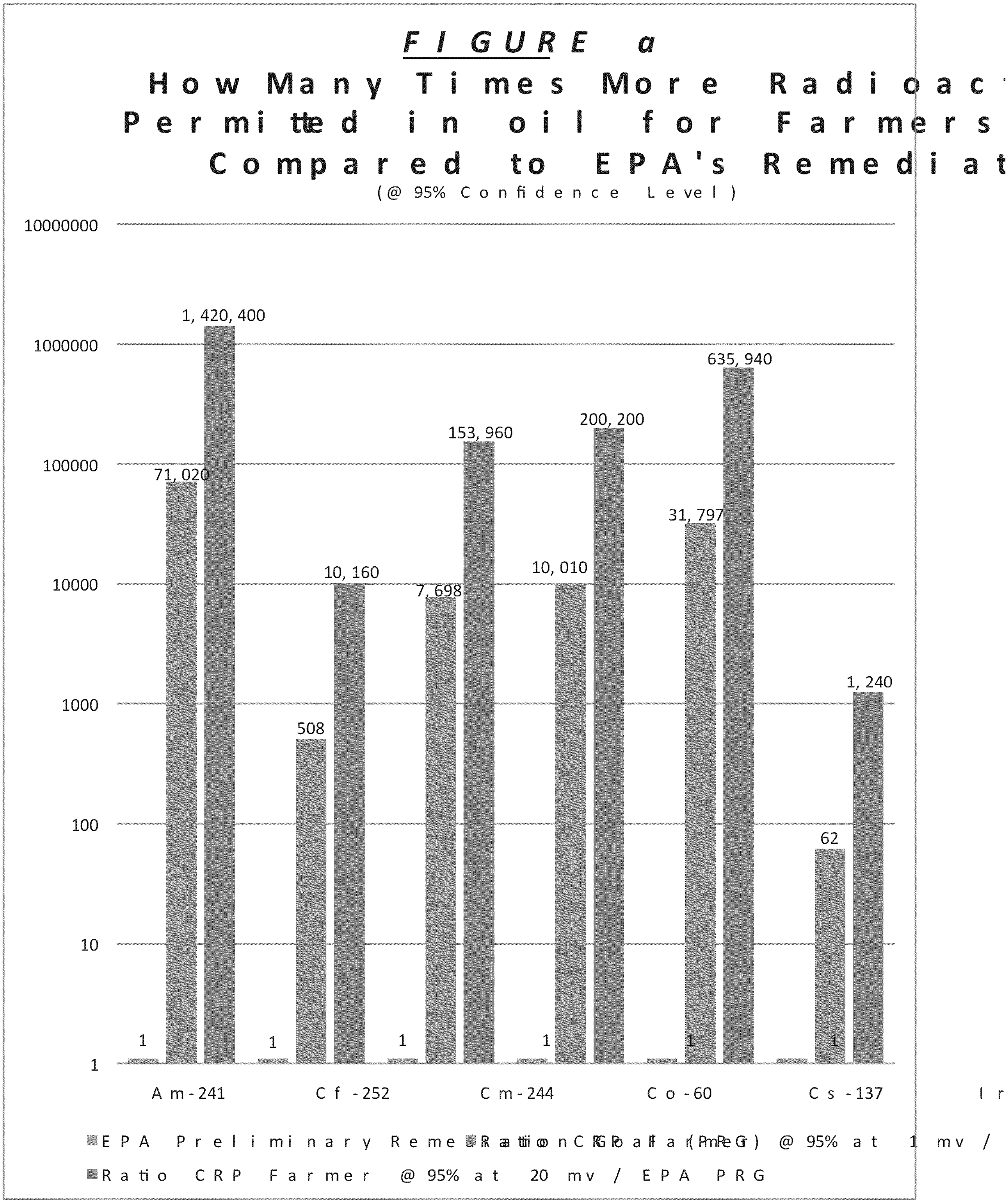


FIGURE a
How Many Times More Radioac
Permitted in oil for Farmers
Compared to EPA's Remediat
(@ 95% Confidence Level)
10000000
1000000
100000
10000
1000
100
10
1
1, 420, 400
71, 020
10, 160
508
153, 960
7, 698
200, 200
10, 010
635, 940
31, 797
1, 240
62
1
Am-241
Cf-252
Cm-244
Co-60
Cs-137
Ir
EPA Preliminary Reme
Ratio CRP Farmer @ 95% at 1 mv /
Ratio CRP Farmer @ 95% at 20 mv / EPA PRG

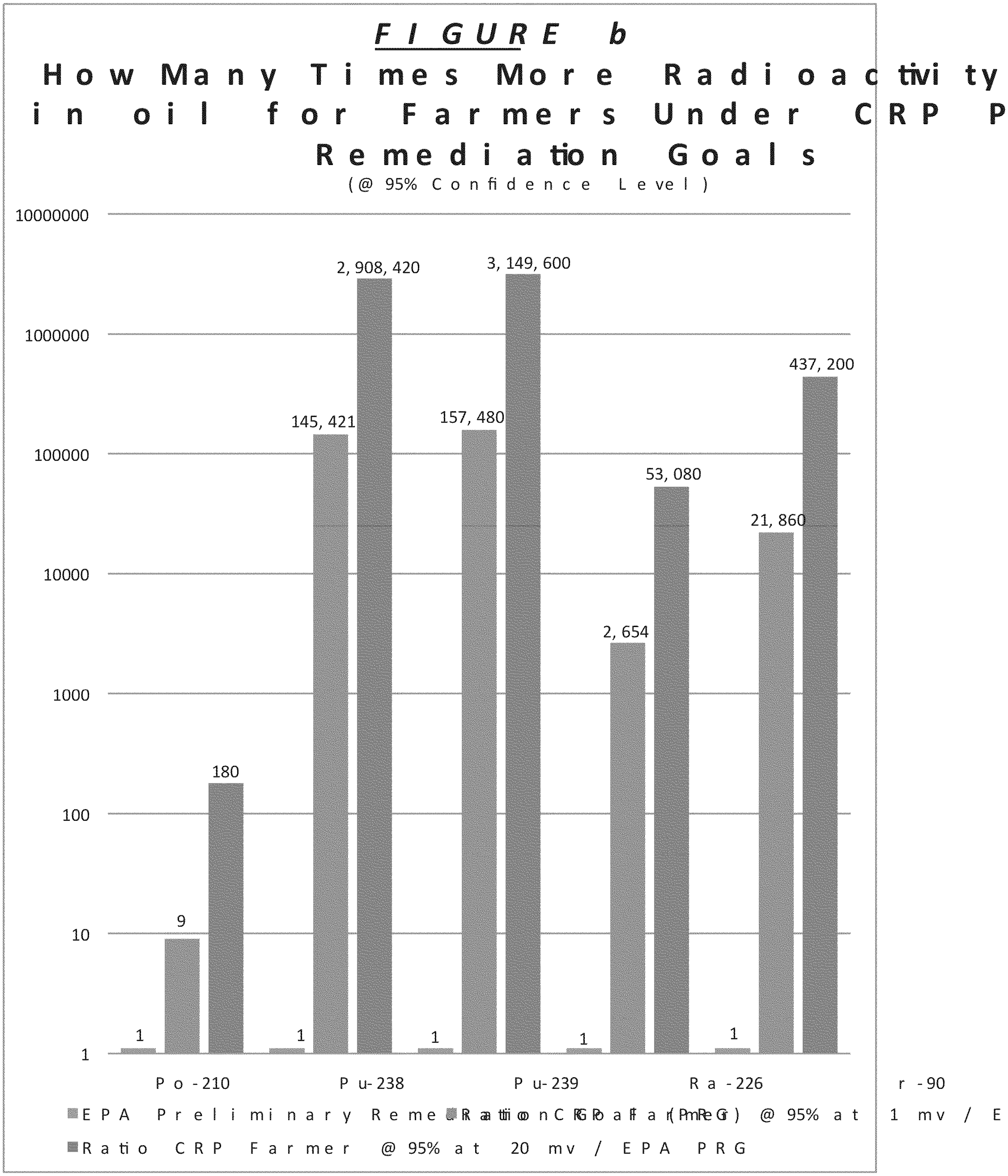


FIGURE b
How Many Times More Radioactivity in oil for Farmers Under CRP P Remediation Goals
(@ 95% Confidence Level)
10000000
1000000
100000
10000
1000
100
10
1
2,908,420
3,149,600
437,200
145,421
157,480
53,080
21,860
2,654
180
9
1
1
1
1
1
Po-210
Pu-238
Pu-239
Ra-226
r-90
EPA Preliminary Remediation Goal (PRG)
Ratio CRP Farmer @ 95% at 1 mv / E
Ratio CRP Farmer @ 95% at 20 mv / EPA PRG

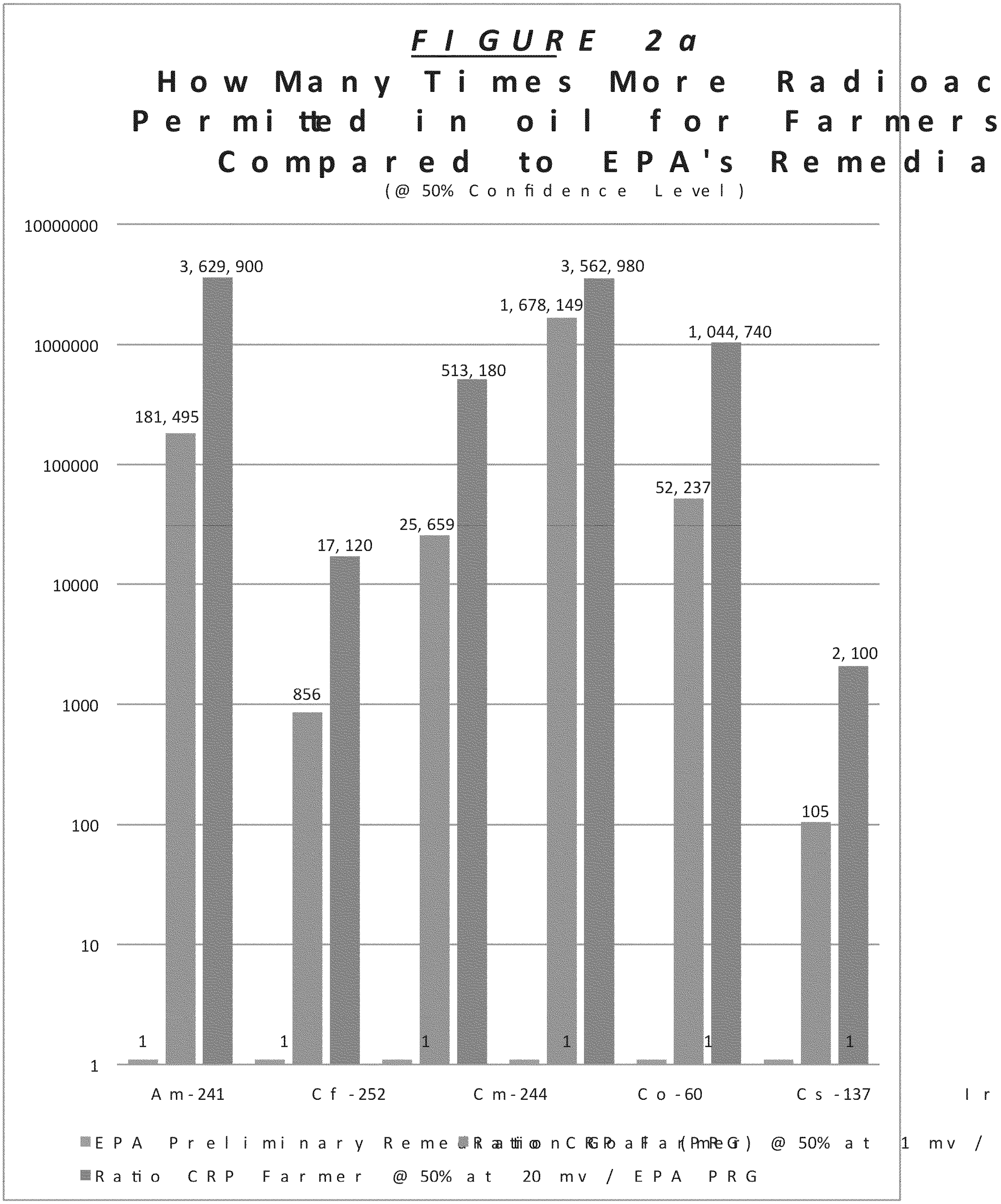


FIGURE 2a
How Many Times More Radioac
Permitted in oil for Farmers
Compared to EPA's Remediat
(@ 50% Confidence Level)
10000000
1000000
100000
10000
1000
100
10
1
3,629,900
181,495
1
17,120
856
1
513,180
25,659
1
1,678,149
3,562,980
1
1,044,740
52,237
1
2,100
105
1
Am-241
Cf-252
Cm-244
Co-60
Cs-137
Ir-
EPA Preliminary Reme
Ratio CRP Farmer @ 50% at 1 mv / E
Ratio CRP Farmer @ 50% at 20 mv / EPA PRG

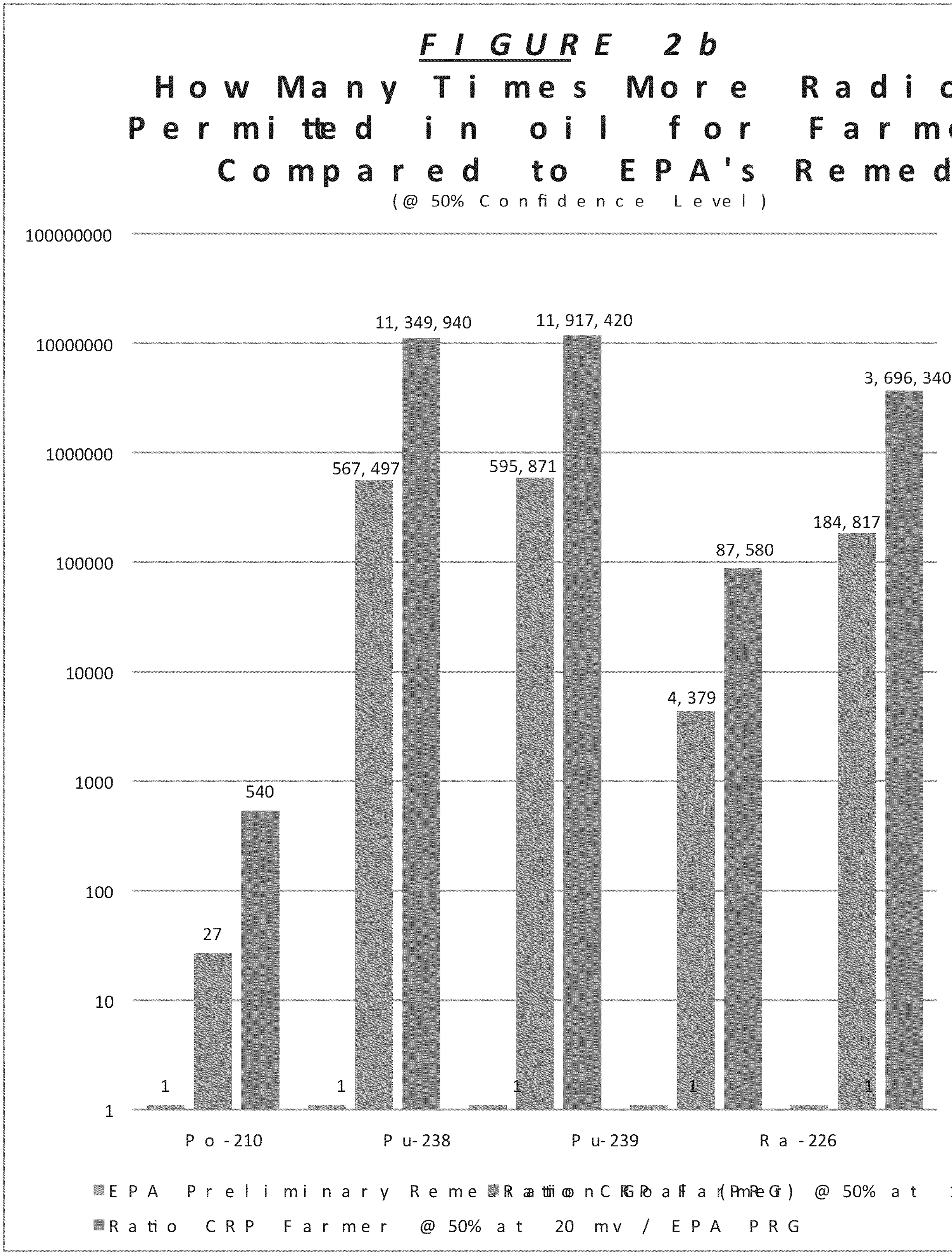


FIGURE 2b
How Many Times More Radioact
Permitted in oil for Farmers
Compared to EPA's Remediat
(@ 50% Confidence Level)
100000000
10000000
1000000
100000
10000
1000
100
10
1
11,349,940
11,917,420
3,696,340
567,497
595,871
184,817
87,580
4,379
540
27
1
1
1
1
1
Po-210
Pu-238
Pu-239
Ra-226
r-90
EPA Preliminary Reme
Ratio CRP Farmer (PRG) @ 50% at 1 mv /
Ratio CRP Farmer @ 50% at 20 mv / EPA PRG

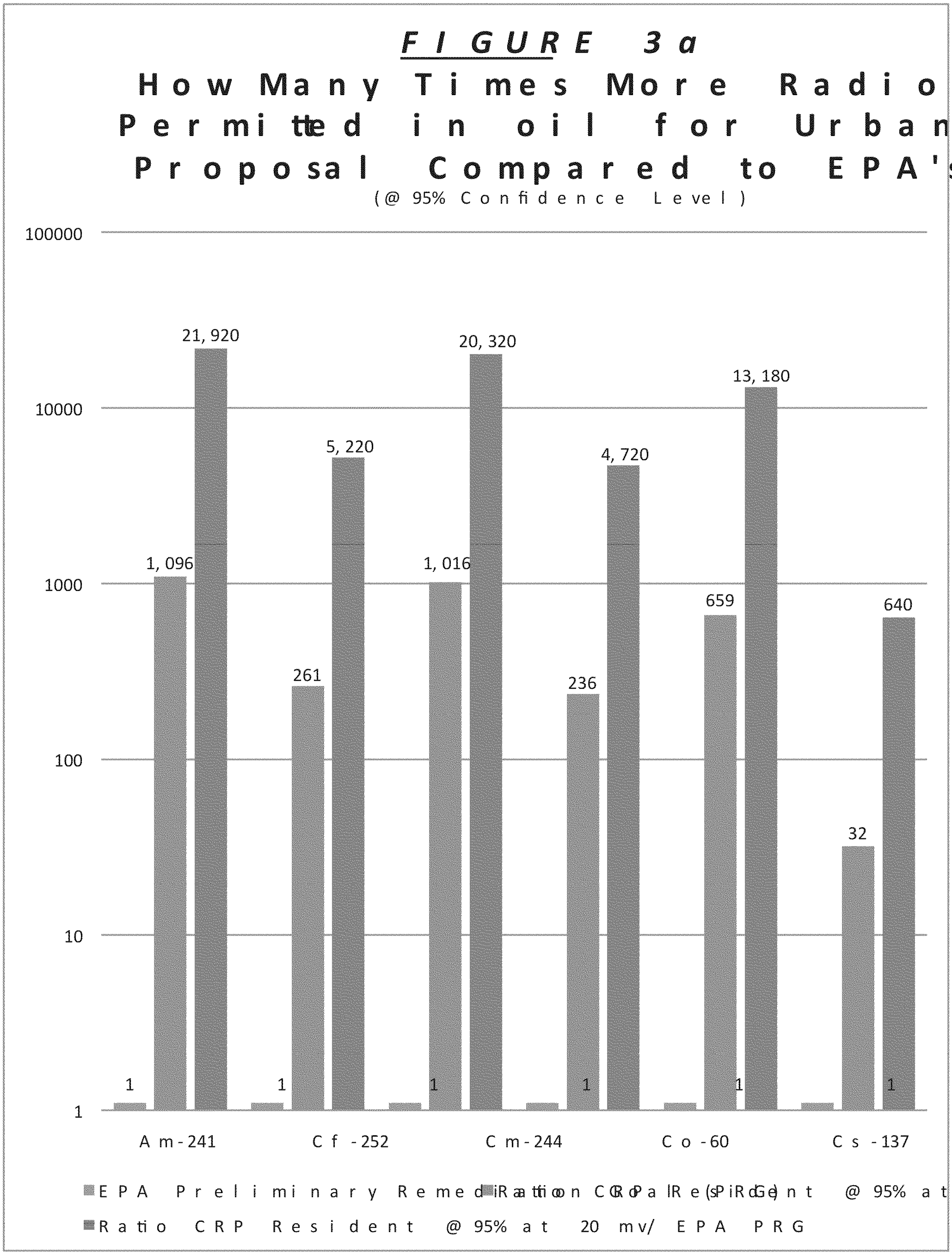


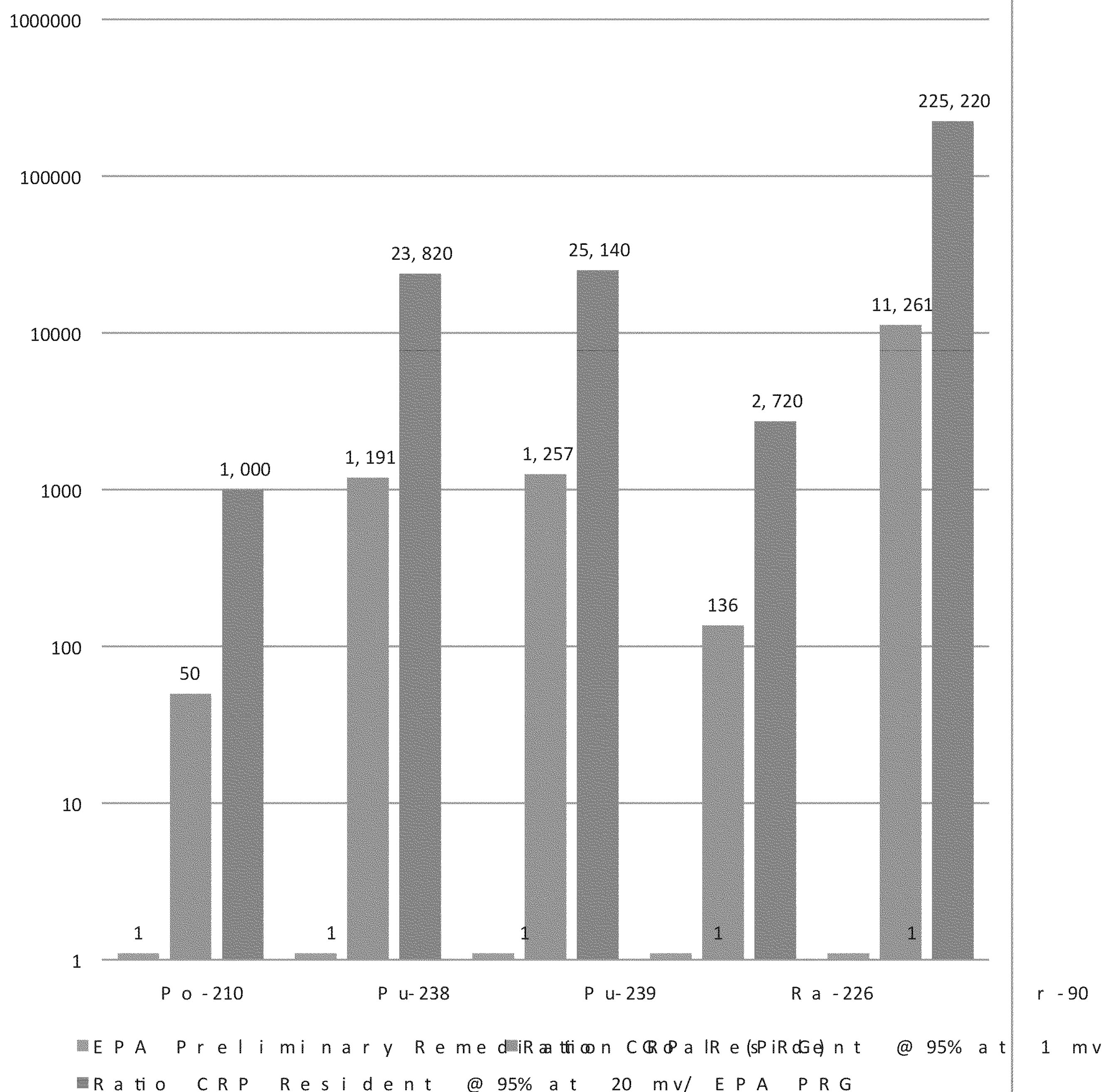
FIGURE 3a
How Many Times More Radioactiv
Permitted in oil for Urban Re
Proposal Compared to EPA's Re
(@ 95% Confidence Level)
100000
10000
1000
100
10
1
21,920
20,320
13,180
5,220
4,720
1,096
1,016
659
640
261
236
32
Am-241
Cf-252
Cm-244
Co-60
Cs-137
EPA Preliminary Remediation Goal (PRG)
Ratio CRP Resident @ 95% at 1 mv
Ratio CRP Resident @ 95% at 20 mv/ EPA PRG

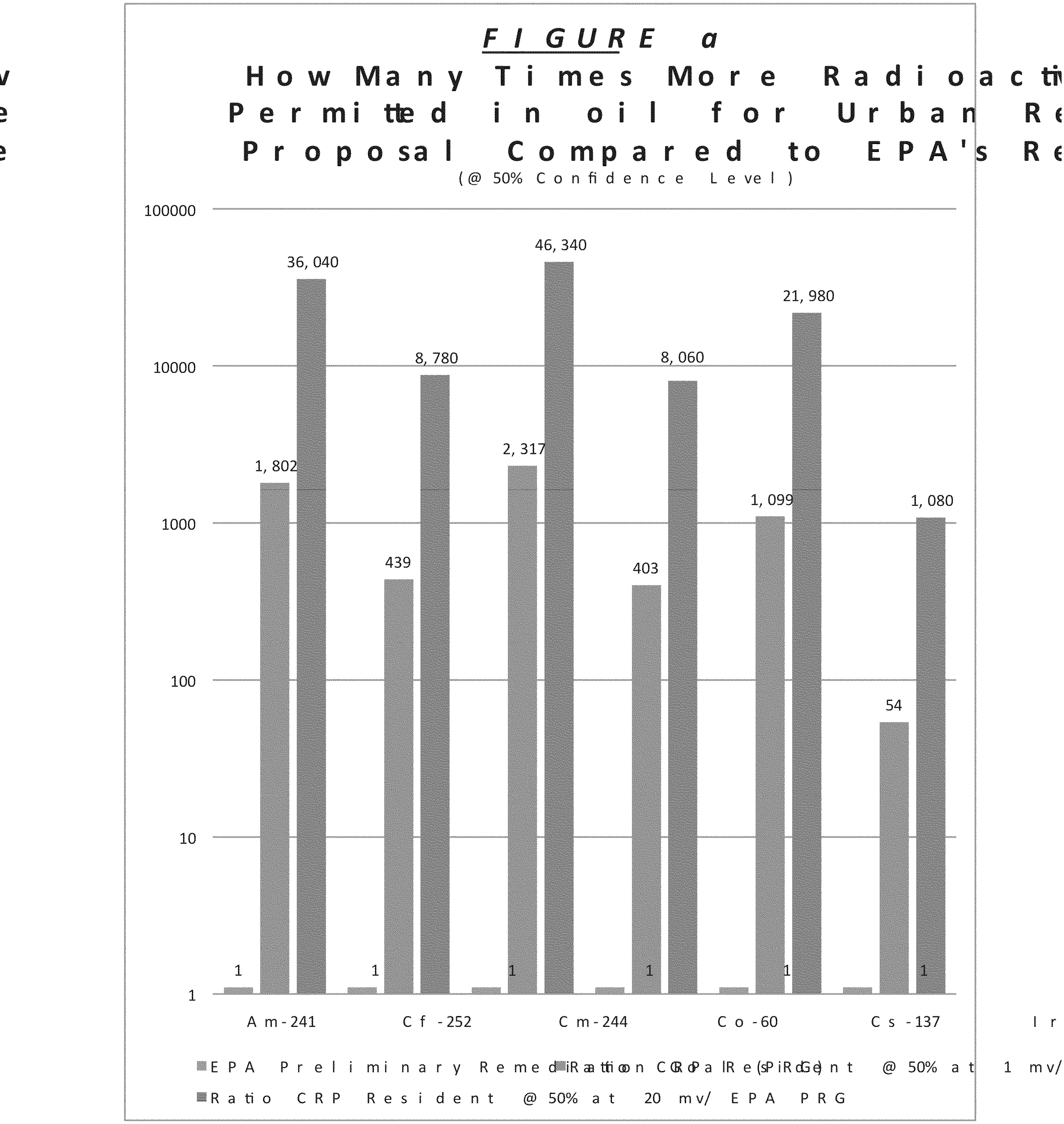
i

FIGURE 3b

How Many Times More Radioact
Permitted in oil for Urban R
Proposal Compared to EPA's R

(@ 95% Confidence Level)





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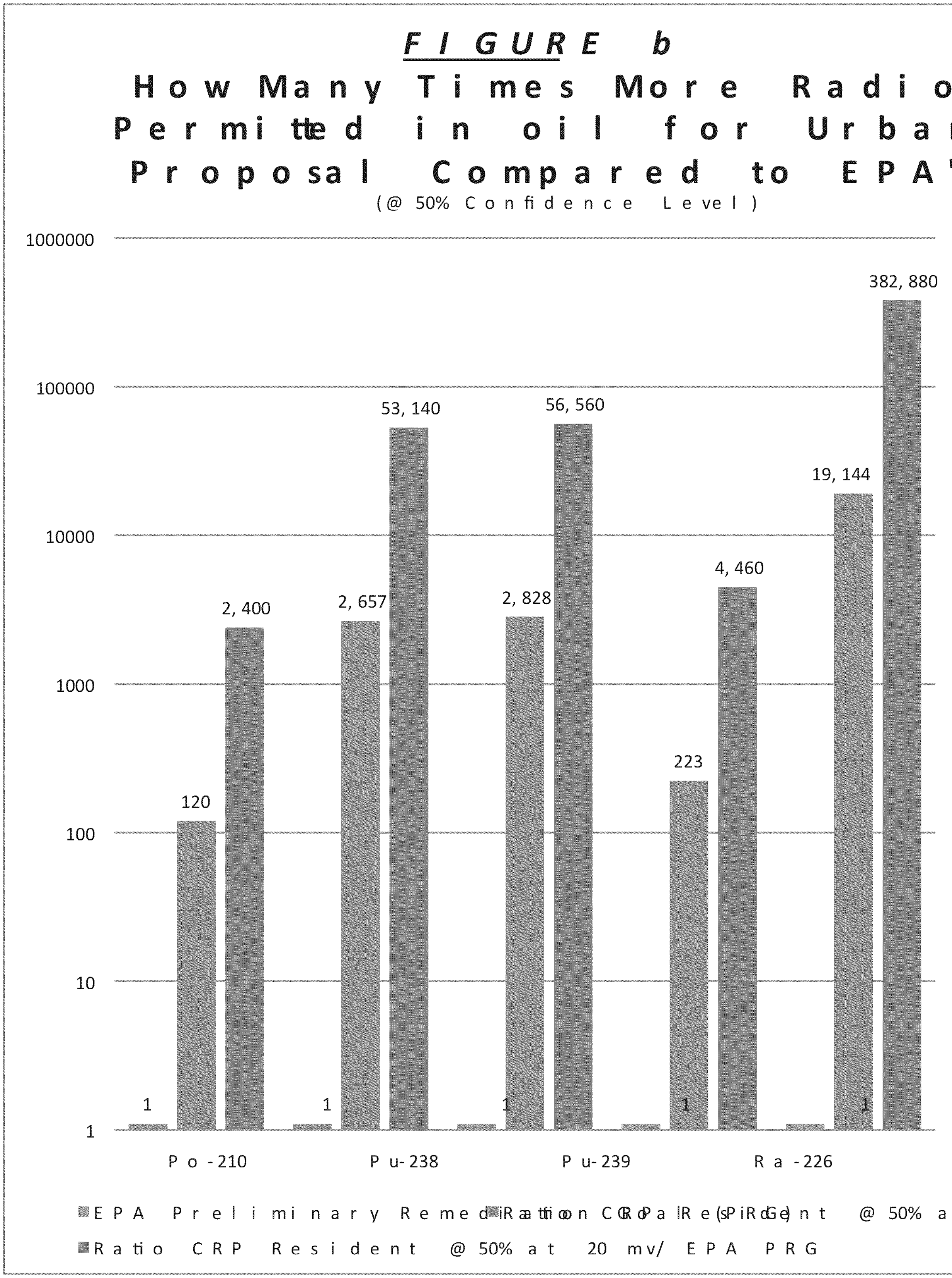


FIGURE b
How Many Times More Radioactiv
Permitted in oil for Urban Re
Proposal Compared to EPA's Re
(@ 50% Confidence Level)
1000000
100000
10000
1000
100
10
1
382, 880
53, 140
56, 560
19, 144
4, 460
2, 400
2, 657
2, 828
223
120
1
Po-210
Pu-238
Pu-239
Ra-226
r-90
EPA Preliminary Remediation Goal (PRG)
Ratio CRP Resident @ 50% at 1 mv/
Ratio CRP Resident @ 50% at 20 mv/ EPA PRG

m

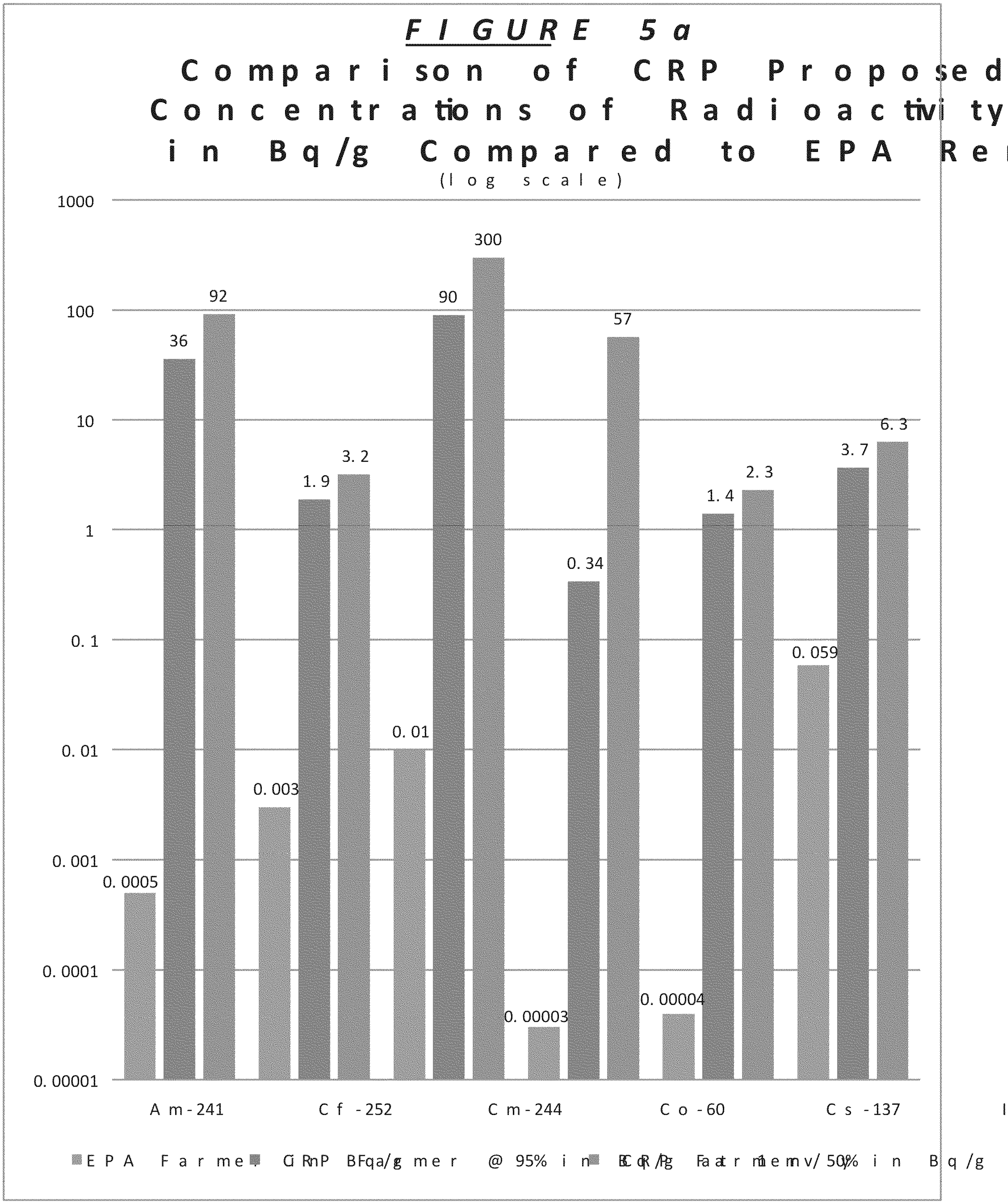
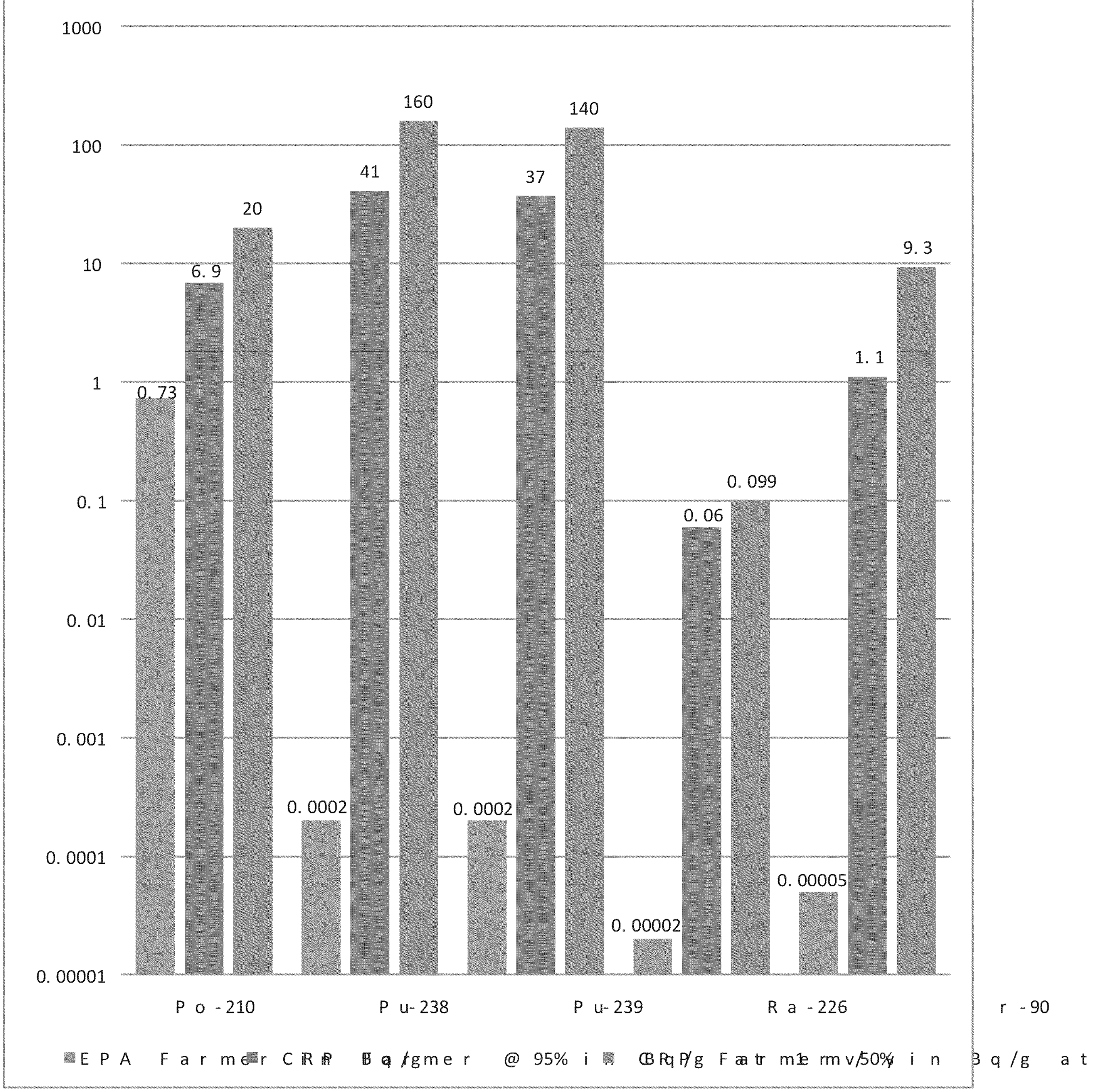


FIGURE 5a
Comparison of CRP Proposed
Concentrations of Radioactivity
in Bq/g Compared to EPA Re
(log scale)
1000
100
10
1
0.1
0.01
0.001
0.0001
0.00001
0.0005
36
92
0.003
1.9
3.2
0.01
90
300
0.00003
0.34
57
0.00004
1.4
2.3
0.059
3.7
6.3
Am-241
Cf-252
Cm-244
Co-60
Cs-137
EPA Farmer
CRP Farmer @ 95% in Bq/g
CRP Farmer @ 50% in Bq/g

***<u>FIGURE</u>* 5b**

Comparison of CRP Proposed Concentrations of Radioactivity in Bq/g Compared to EPA Rem

(log scale)



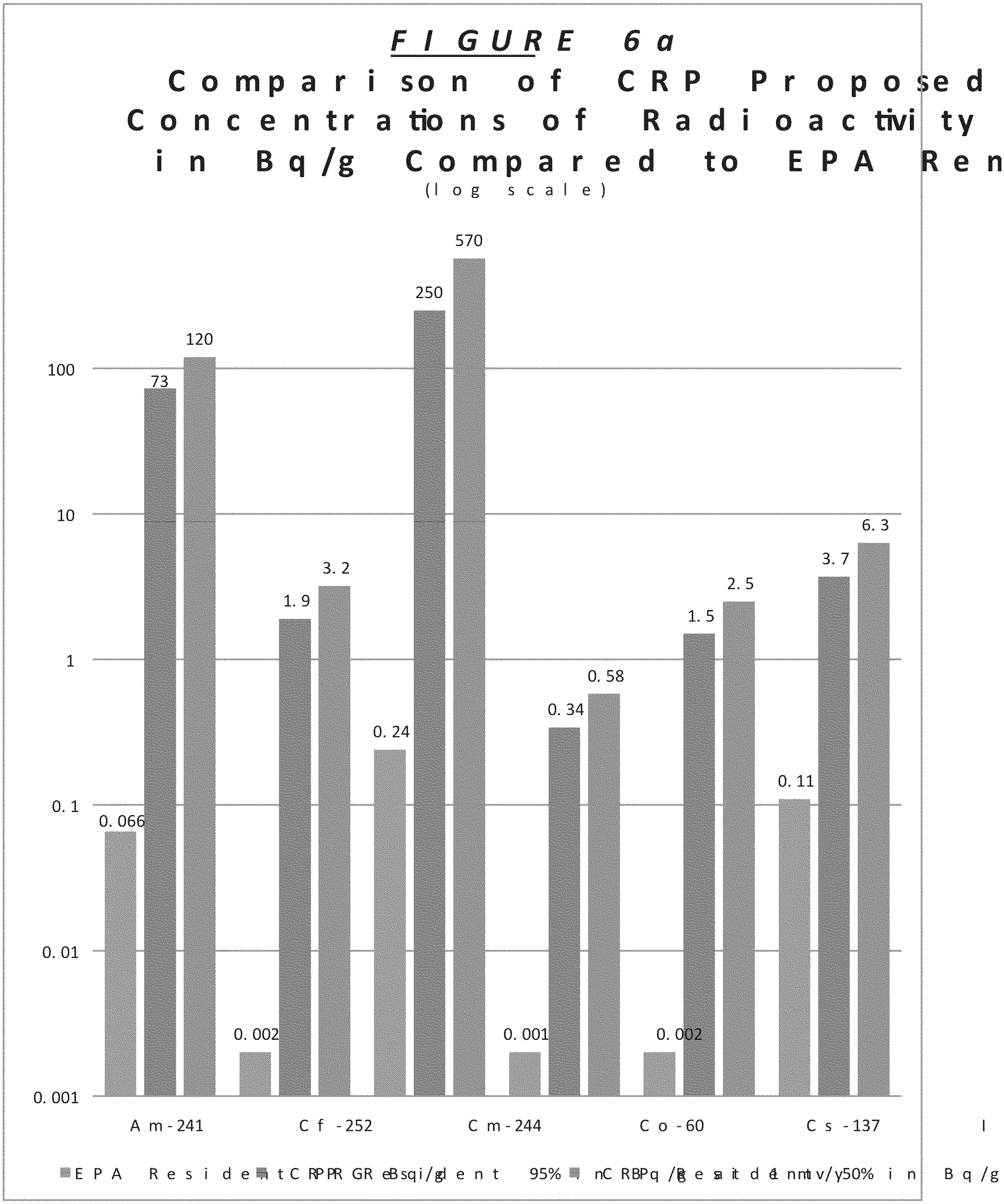


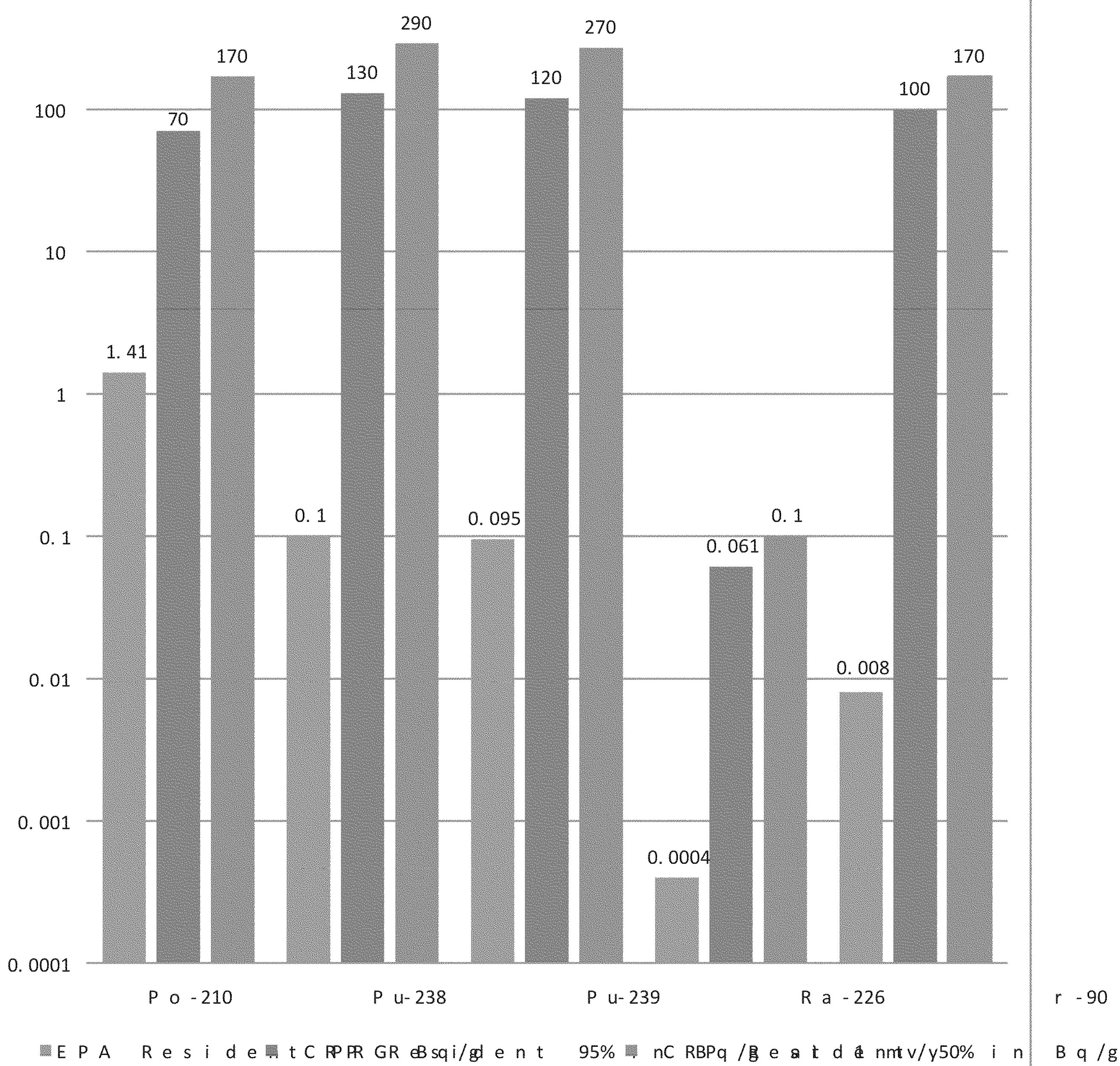
FIGURE 6a
Comparison of CRP Proposed Concentrations of Radioactivity in Bq/g Compared to EPA Ren
(log scale)
100
10
1
0.1
0.01
0.001
0.066
73
120
0.002
1.9
3.2
0.24
250
570
0.001
0.34
0.58
0.002
1.5
2.5
0.11
3.7
6.3
Am-241
Cf-252
Cm-244
Co-60
Cs-137

n

FIGURE 6b

Comparison of CRP Proposed Concentrations of Radioactivity in Bq/g Compared to EPA Ren

(log scale)



To: Ellis, Jerry[Ellis.Jerry@epa.gov]
Cc: Christ, Lisa[Christ.Lisa@epa.gov]; Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]
From: DeCair, Sara
Sent: Tue 3/31/2015 9:17:02 PM
Subject: Messaging and relation between food & water guides
Food-Water bridge language revised 10-28-2008.doc
Messages to consider.docx
PAG Comms Plan new look & content 4-15-2013.docx
PAGs Desk Statement-3-29-2013.pdf
PAGs Key Messages 3-21-2013.pdf

Ex. 5 - Deliberative Process

I've also attached a "Messages to Consider" from our PIO, Jessica, when she knew our ODs were concerned about how to be clear on our new water proposal. I've also attached the past Comms Plan, Key Messages and Desk Statements from the 2013 PAG Manual FR package. Basically, you finish up your Comms Plan and peel out the short Key Messages and Desk Statement word for word, so they're easier to grab when needed.

Thanks, Jerry, for sharing a draft of your comms plan with me soon!

Sara

From: DeCair, Sara
Sent: Wednesday, January 14, 2015 5:04 PM
To: Hernandez-Quinones, Samuel; Christ, Lisa; Ellis, Jerry
Subject: Discussing relation between food & water guides

Sam, Lisa, Jerry,

Ex. 5 - Deliberative Process

Thanks,

Sara

***

Sara,

Ex. 5 - Deliberative Process

To help myself process this thinking, I drafted the following (can we reduce it to 5 words?):

Ex. 5 - Deliberative Process

assessments and make any adjustments necessary to assure the ingestion PAGs will not be reached.

Bill

From: Cunningham, William C. [mailto:william.cunningham@nist.gov]
Sent: Thursday, January 08, 2015 1:29 PM
To: DeCair, Sara
Subject: Re: For Jan. 22, counting on Bill...

Sara,

Happy New Year

Haven't tried to deal with this for a while. Here's what I believe/recall.

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

Bill

From: <DeCair>, Sara <DeCair.Sara@epa.gov>
Date: Thursday, January 8, 2015 11:21 AM
To: "Noska, Michael A (FDA/OC)" <Michael.Noska@fda.hhs.gov>, william cunningham <william.cunningham@nist.gov>
Subject: For Jan. 22, counting on Bill...

Ex. 5 - Deliberative Process

Let me know if you'd like to chat ahead of time. I have a meeting with the Water staff at 1 pm today and we're refining some briefing materials that I'll show on the webinar. There are no huge surprises in the proposal, but I am being very close hold with it since it's so very deliberative at this point.

S.

Sara D. DeCair

http://www.epa.gov/radiation/rert/pags.html

202-343-9108

new office

Room 1416 B in WJC West

To: Christ, Lisa[Christ.Lisa@epa.gov]
Cc: Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]; Ellis, Jerry[Ellis.Jerry@epa.gov]; Veal, Lee[Veal.Lee@epa.gov]; Perrin, Alan[Perrin.Alan@epa.gov]
From: DeCair, Sara
Sent: Mon 3/23/2015 2:47:27 PM
Subject: Re: Cmts due tomorrow: Water PAG proposal
Drinking Water PAG March 18th 2015 Final(2).docx
Drinking Water PAG proposal Subcmte review -SNL Comments.docx
Drinking Water PAG proposal Subcmte review 2-27-2015 Armin.docx
Navy Nuke cmts on water PAG.docx
Water cmts Mackinney.docx
Water comments from USDA.docx

Lisa,

Of course, here are the comments I received. I decided it wasn't voluminous enough to warrant having EnDyna do a compilation, but let me know if you think that would be helpful. They usually do either a spreadsheet of comments or one merged Word version with all the comments. I think we can just incorporate most of the comments without too much trouble.

I'm out the rest of this afternoon but will be in the office tomorrow, Tuesday, so do call or write if you need anything. Thanks!

Sara

From: Christ, Lisa
Sent: Monday, March 23, 2015 9:42 AM
To: DeCair, Sara
Cc: Hernandez-Quinones, Samuel; Ellis, Jerry
Subject: RE: Cmts due tomorrow: Water PAG proposal

Hi Sara –

Please send us the interagency comments on the water PAG so we can begin to assess them before our 3/31 meeting.

Thanks-

Lisa

From: DeCair, Sara
Sent: Tuesday, March 17, 2015 2:46 PM
To: Amy Doll; Andrew.Wallo@eh.doe.gov; asa4@cdc.gov; ben.cacioppo@dtra.mil; Carlos.Corredor@Hq.Doe.Gov; Edward.Regnier@hq.doe.gov; John.Jensen@dm.usda.gov; john.mackinney@dhs.gov; john.madrid@dtra.mil; lee.a.nickel1@navy.mil; lodwick.jeffrey@dol.gov; michael.howe@fema.dhs.gov; Michael.Noska@fda.hhs.gov; Patricia.Milligan@nrc.gov; paul.ward@fema.dhs.gov; ricardo.a.reyes@us.army.mil; siddhanti@endyna.com; tdkraus@sandia.gov; Veal, Lee; Wieder, Jessica; william.cunningham@nist.gov
Cc: Hernandez-Quinones, Samuel; Christ, Lisa; Ellis, Jerry
Subject: Cmts due tomorrow: Water PAG proposal

Hi all; just a quick reminder that we hope to hear from you by the end of the day tomorrow with your feedback on the water proposal. Please let me know right away if you have any concerns, and I look forward to seeing what you think!

Sara

From: DeCair, Sara
Sent: Tuesday, March 03, 2015 2:16 PM
To: Amy Doll; 'Andrew.Wallo@eh.doe.gov'; 'asa4@cdc.gov'; 'ben.cacioppo@dtra.mil'; 'Carlos.Corredor@Hq.Doe.Gov'; 'Edward.Regnier@hq.doe.gov'; 'John.Jensen@dm.usda.gov'; john.mackinney@dhs.gov; 'john.madrid@dtra.mil'; 'lee.a.nickel1@navy.mil'; 'lodwick.jeffrey@dol.gov'; 'michael.howe@fema.dhs.gov'; 'Michael.Noska@fda.hhs.gov'; 'Patricia.Milligan@nrc.gov'; 'paul.ward@fema.dhs.gov'; 'ricardo.a.reyes@us.army.mil'; siddhanti@endyna.com; 'tdkraus@sandia.gov'; Veal, Lee; Wieder, Jessica; 'william.cunningham@nist.gov'
Cc: Hernandez-Quinones, Samuel; Christ, Lisa; Ellis, Jerry
Subject: Water PAG proposal: review by Mar. 18th

PAGs Subcommittee;

We'd like to share a copy of our draft drinking water PAG language for your review. Since this material is still pre-decisional, we request that you do not circulate it beyond the FRPCC PAGs subcommittee. Please contact me for any further guidance, if needed. This document will serve as our Federal Register proposed language and you can see that it provides a lot of explanatory text. After we receive and address public comments, the appropriate language will be used as our Water chapter in a final PAG Manual.

We encourage you to send us feedback on content, wording, and the methods within the next two weeks. **Your comments for this round of review are due Wed., Mar. 18, 2015.**

Our contractor, EnDyna, will collect and organize your comments and we'll run an updated version past you before we complete internal EPA and legal reviews. This won't be your last chance to provide input, though, since we will have a follow up discussion with you about the FR Notice and the Rollout Plan. Afterwards, there will be the OMB interagency review cycle with your agencies.

Thank you in advance for your thoughtful input. Please do write or call if you have any questions. Talk to you soon!

Sara

Sara D. DeCair

http://www.epa.gov/radiation/rert/pags.html

202-343-9108

new office

Room 1416 B in WJC West

To: Christ, Lisa[Christ.Lisa@epa.gov]; Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]
From: Ellis, Jerry
Sent: Mon 3/23/2015 2:17:43 PM
Subject: Updated DW PAG communication strategy
DRAFT Drinking Water PAG Communications Plan vMarch 23 2015.doc

Good morning Lisa and Sam:

I have updated the strategy based upon Lisa's edits and have made some minor editorial changes.

Jerry L. Ellis, Jr.

Environmental Scientist

U.S. Environmental Protection Agency

Standards and Risk Management Division

Office of Ground Water and Drinking Water

1200 Pennsylvania Ave. (4607M), N.W.

Washington, D.C. 20460

Phone: 202-564-2766

To: Amy Doll[adoll@endyna.com]; Andrew.Wallo@eh.doe.gov[Andrew.Wallo@eh.doe.gov]; asa4@cdc.gov[asa4@cdc.gov]; ben.cacioppo@dtra.mil[ben.cacioppo@dtra.mil]; Carlos.Corredor@Hq.Doe.Gov[Carlos.Corredor@Hq.Doe.Gov]; Edward.Regnier@hq.doe.gov[Edward.Regnier@hq.doe.gov]; John.Jensen@dm.usda.gov[John.Jensen@dm.usda.gov]; john.mackinney@dhs.gov[john.mackinney@dhs.gov]; john.madrid@dtra.mil[john.madrid@dtra.mil]; lee.a.nickel1@navy.mil[lee.a.nickel1@navy.mil]; lodwick.jeffrey@dol.gov[lodwick.jeffrey@dol.gov]; michael.howe@fema.dhs.gov[michael.howe@fema.dhs.gov]; Michael.Noska@fda.hhs.gov[Michael.Noska@fda.hhs.gov]; Patricia.Milligan@nrc.gov[Patricia.Milligan@nrc.gov]; paul.ward@fema.dhs.gov[paul.ward@fema.dhs.gov]; ricardo.a.reyes@us.army.mil[ricardo.a.reyes@us.army.mil]; siddhanti@endyna.com[siddhanti@endyna.com]; tdkraus@sandia.gov[tdkraus@sandia.gov]; Veal, Lee[Veal.Lee@epa.gov]; Wieder, Jessica[Wieder.Jessica@epa.gov]; william.cunningham@nist.gov[william.cunningham@nist.gov]
Cc: Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]; Christ, Lisa[Christ.Lisa@epa.gov]; Ellis, Jerry[Ellis.Jerry@epa.gov]
From: DeCair, Sara
Sent: Tue 3/17/2015 6:46:23 PM
Subject: Cmts due tomorrow: Water PAG proposal

Hi all; just a quick reminder that we hope to hear from you by the end of the day tomorrow with your feedback on the water proposal. Please let me know right away if you have any concerns, and I look forward to seeing what you think!

Sara

From: DeCair, Sara
Sent: Tuesday, March 03, 2015 2:16 PM
To: Amy Doll; 'Andrew.Wallo@eh.doe.gov'; 'asa4@cdc.gov'; 'ben.cacioppo@dtra.mil'; 'Carlos.Corredor@Hq.Doe.Gov'; 'Edward.Regnier@hq.doe.gov'; 'John.Jensen@dm.usda.gov'; john.mackinney@dhs.gov; 'john.madrid@dtra.mil'; 'lee.a.nickel1@navy.mil'; 'lodwick.jeffrey@dol.gov'; 'michael.howe@fema.dhs.gov'; 'Michael.Noska@fda.hhs.gov'; 'Patricia.Milligan@nrc.gov'; 'paul.ward@fema.dhs.gov'; 'ricardo.a.reyes@us.army.mil'; siddhanti@endyna.com; 'tdkraus@sandia.gov'; Veal, Lee; Wieder, Jessica; 'william.cunningham@nist.gov'
Cc: Hernandez-Quinones, Samuel; Christ, Lisa; Ellis, Jerry
Subject: Water PAG proposal: review by Mar. 18th

PAGs Subcommittee;

We’d like to share a copy of our draft drinking water PAG language for your review. Since this material is still pre-decisional, we request that you do not circulate it beyond the FRPCC PAGs subcommittee. Please contact me for any further guidance, if needed. This document will serve as our Federal Register proposed language and you can see that it provides a lot of explanatory text. After we receive and address public comments, the appropriate language will be used as our Water chapter in a final PAG Manual.

We encourage you to send us feedback on content, wording, and the methods within the next two weeks. **Your comments for this round of review are due Wed., Mar. 18, 2015.**

Our contractor, EnDyna, will collect and organize your comments and we'll run an updated version past you before we complete internal EPA and legal reviews. This won't be your last chance to provide input, though, since we will have a follow up discussion with you about the FR Notice and the Rollout Plan. Afterwards, there will be the OMB interagency review cycle with your agencies.

Thank you in advance for your thoughtful input. Please do write or call if you have any questions. Talk to you soon!

Sara

Sara D. DeCair

http://www.epa.gov/radiation/rert/pags.html

202-343-9108

new office

Room 1416 B in WJC West

To: Christ, Lisa[Christ.Lisa@epa.gov]
Cc: DeCair, Sara[DeCair.Sara@epa.gov]; Perrin, Alan[Perrin.Alan@epa.gov]; Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]; Ellis, Jerry[Ellis.Jerry@epa.gov]; Wieder, Jessica[Wieder.Jessica@epa.gov]
From: Veal, Lee
Sent: Tue 3/3/2015 7:23:47 PM
Subject: Re: quick review: Water chapter to Subcmte

Thank you! This is an exciting milestone for our team.

Lee Ann B Veal
Director, Center for Radiological Emergency Management
Office of Radiation and Indoor Air
USEPA
Office 202-343-9448
Cell 202-617-4322

On Mar 3, 2015, at 2:05 PM, Christ, Lisa <Christ.Lisa@epa.gov> wrote:

Hi Sara,

We're comfortable with your edits to the document and have no comments to the note below to the subcommittee.

Thanks-

Lisa

From: DeCair, Sara
Sent: Friday, February 27, 2015 4:03 PM
To: Veal, Lee; Perrin, Alan; Christ, Lisa; Hernandez-Quinones, Samuel; Ellis, Jerry; Wieder, Jessica
Subject: quick review: Water chapter to Subcmte
Importance: High

Draft note to the Subcmte with attached chapter for their review. FYI in the chapter,

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process Please let me know early next week if you see any changes needed in the chapter or this note, and I can send it out ASAP!

Sara

---------_________________

PAGs Subcommittee;

We'd like to share a copy of our draft drinking water PAG language for your review. This document will serve as our Federal Register proposed language and you can see that it provides a lot of explanatory text. Once we receive and address public comments, the appropriate language will be used as our Water chapter in a final PAG Manual.

We encourage you to send us feedback on content, wording, and the methods within the next two weeks. **Your comments for this round of review are due {Monday, Mar. 16th}.**

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Thank you in advance for your thoughtful input. Please do write or call if you have any questions. Talk to you soon!

Sara

Sara D. DeCair

http://www.epa.gov/radiation/rert/pags.html

202-343-9108

new office

Room 1416 B in WJC West

To: Christ, Lisa[Christ.Lisa@epa.gov]; Veal, Lee[Veal.Lee@epa.gov]; Perrin, Alan[Perrin.Alan@epa.gov]; Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]; Ellis, Jerry[Ellis.Jerry@epa.gov]; Wieder, Jessica[Wieder.Jessica@epa.gov]
From: DeCair, Sara
Sent: Tue 3/3/2015 7:16:08 PM
Subject: RE: quick review: Water chapter to Subcmte

Super, thanks! Here it goes, you will be cc'ed.

Sara

From: Christ, Lisa
Sent: Tuesday, March 03, 2015 2:06 PM
To: DeCair, Sara; Veal, Lee; Perrin, Alan; Hernandez-Quinones, Samuel; Ellis, Jerry; Wieder, Jessica
Subject: RE: quick review: Water chapter to Subcmte

Hi Sara,

We're comfortable with your edits to the document and have no comments to the note below to the subcommittee.

Thanks-

Lisa

From: DeCair, Sara
Sent: Friday, February 27, 2015 4:03 PM
To: Veal, Lee; Perrin, Alan; Christ, Lisa; Hernandez-Quinones, Samuel; Ellis, Jerry; Wieder, Jessica
Subject: quick review: Water chapter to Subcmte
Importance: High

Draft note to the Subcmte with attached chapter for their review. FYI in the chapter, I

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process Please let me know early next week if you see any changes needed in the chapter or this note, and I can send it out ASAP!

Sara

---------________________

PAGs Subcommittee;

We'd like to share a copy of our draft drinking water PAG language for your review. This document will serve as our Federal Register proposed language and you can see that it provides a lot of explanatory text. Once we receive and address public comments, the appropriate language will be used as our Water chapter in a final PAG Manual.

We encourage you to send us feedback on content, wording, and the methods within the next two weeks. **Your comments for this round of review are due {Monday, Mar. 16th}.**

Our contractor, EnDyna, will collect and organize your comments and we'll run an updated version past you before we complete internal EPA and legal reviews. This won't be your last chance to provide input, though, since we will have a follow up discussion with you about the FR Notice and the Rollout Plan. Afterwards, there will be the OMB interagency review cycle with your agencies.

Thank you in advance for your thoughtful input. Please do write or call if you have any questions. Talk to you soon!

Sara

Sara D. DeCair

http://www.epa.gov/radiation/rert/pags.html

202-343-9108

new office

Room 1416 B in WJC West

To: Christ, Lisa[Christ.Lisa@epa.gov]; Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]
From: Ellis, Jerry
Sent: Tue 3/3/2015 3:01:44 PM
Subject: Draft DW PAG Communications Plan
DRAFT Drinking Water PAG Communications Plan.doc

Hi Lisa and Sam:

Please review this plan and send me written edits/comments. After I get a good Comm Plan, I will draft the fact sheets and Q&A documents.

FYI- Giselle has informed me that her review time is about three weeks which includes Peter G's signature if we only have a comm plan, fact sheet and Q&A document. More time would be involved if we update the OGWDW website.

Jerry L. Ellis, Jr.

Environmental Scientist

U.S. Environmental Protection Agency

Standards and Risk Management Division

Office of Ground Water and Drinking Water

1200 Pennsylvania Ave. (4607M), N.W.

Washington, D.C. 20460

Phone: 202-564-2766

To: Christ, Lisa[Christ.Lisa@epa.gov]; Edwards, Jonathan[Edwards.Jonathan@epa.gov]; Perrin, Alan[Perrin.Alan@epa.gov]
Cc: Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]; Veal, Lee[Veal.Lee@epa.gov]; Oshida, Phil[Oshida.Phil@epa.gov]; Burneson, Eric[Burneson.Eric@epa.gov]
From: DeCair, Sara
Sent: Mon 2/23/2015 6:09:05 PM
Subject: Re: Rads PAG revised chapter
2-23-15 Draft Drinking Water PAG_track change (DeCair, Sara).docx

Lisa,

Thank you so much! This looks really great. I am doing a thorough review and will share with you my draft note for the Subcommittee asking them for input within two weeks or so. My review will probably take me until tomorrow, I think.

Thanks again,

Sara

From: Christ, Lisa
Sent: Monday, February 23, 2015 11:27 AM
To: Edwards, Jonathan
Cc: Hernandez-Quinones, Samuel; DeCair, Sara; Veal, Lee; Oshida, Phil; Burneson, Eric
Subject: FW: Rads PAG revised chapter

Hi Jon,

We appreciate your patience…Attached is the revised rads PAG proposal for review by the interagency PAG subcommittee. In addition, I've attached a redline-strikeout version that shows Eric and Peter's comments on the previous draft. Let us know if you have any questions or concerns. I anticipate the subcommittee will have comments questions too.

Thanks-

Lisa

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Lisa Christ, Chief

Targeting and Analysis Branch

Office of Ground Water and Drinking Water

USEPA

1200 Pennsylvania Ave NW
Washington, DC 20460-0001
phone: 202.564.8354
fax: 202.564-3760

Mail Code: 4607M
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

To: Christ, Lisa[Christ.Lisa@epa.gov]
Cc: Oshida, Phil[Oshida.Phil@epa.gov]
From: Hernandez-Quinones, Samuel
Sent: Fri 2/20/2015 9:12:18 PM
Subject: Re: Rads PAG proposal
2-20-15 Draft Chapter Drinking Water PAG SHQ.docx

Hi Lisa,

attached is the revised version of the DW PAG Chapter. Let me know if you have any questions or comments.

Thanks

Sam

==

Samuel Hernández Quiñones, P.E.
Environmental Engineer
Environmental Protection Agency
Office of Water
1200 Pennsylvania Ave. NW
Washington, DC 20460
202-564-1735

"USEPA Protecting Human Health and the Environment"

From: Christ, Lisa
Sent: Friday, February 20, 2015 1:36 PM
To: Hernandez-Quinones, Samuel
Cc: Oshida, Phil
Subject: RE: Rads PAG proposal

Hi Sam,

Please send it to me and Phil by COB today. Phil owes Jon Edwards a call and copy of the revised proposal. We'll let Jon forward it on to Sara and Lee (we can let them know it's coming).

Thanks!

Lisa

Ex. 6 - Personal Privacy

From: Hernandez-Quinones, Samuel
Sent: Friday, February 20, 2015 1:31 PM
To: Christ, Lisa
Subject: Re: Rads PAG proposal

Ok, I was able to make a lot of progress this morning. I think I will be able to send this to Sara by COB today. I will copy you on that email.

Sam

==

Samuel Hernández Quiñones, P.E.
Environmental Engineer
Environmental Protection Agency
Office of Water
1200 Pennsylvania Ave. NW
Washington, DC 20460
202-564-1735

"USEPA Protecting Human Health and the Environment"

From: Christ, Lisa
Sent: Friday, February 20, 2015 12:08 PM
To: Hernandez-Quinones, Samuel
Subject: RE: Rads PAG proposal

Hi Sam,

Please let me know which comments you are still working to address. I can help with answering his concerns.

Thanks-

Lisa

From: Hernandez-Quinones, Samuel
Sent: Friday, February 20, 2015 10:16 AM
To: Christ, Lisa
Subject: Re: Rads PAG proposal

Hi Lisa,

I am still working on addressing some of Peter's comments. I dont know if it will be completed today but I will try to have this completed very soon.

Sam

==

Samuel Hernández Quiñones, P.E.
Environmental Engineer
Environmental Protection Agency
Office of Water
1200 Pennsylvania Ave. NW
Washington, DC 20460
202-564-1735

"USEPA Protecting Human Health and the Environment"

From: Christ, Lisa
Sent: Friday, February 20, 2015 8:58 AM
To: Hernandez-Quinones, Samuel
Subject: Rads PAG proposal

Hi Sam,

Can we get the revised proposal to ORIA today? Phil owes a call to Jon Edwards today on the status.

Lisa

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Lisa Christ, Chief

Targeting and Analysis Branch

Office of Ground Water and Drinking Water

USEPA

1200 Pennsylvania Ave NW
Washington, DC 20460-0001
phone: 202.564.8354
fax: 202.564-3760

Mail Code: 4607M
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

To: Christ, Lisa[Christ.Lisa@epa.gov]
Cc: Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]
From: Ellis, Jerry
Sent: Wed 2/18/2015 3:09:19 PM
Subject: RE: Radiation PAGs, Communications strategy templates

Certainly, I will use the long form.

Jerry L. Ellis, Jr.

Environmental Scientist

U.S. Environmental Protection Agency

Standards and Risk Management Division

Office of Ground Water and Drinking Water

1200 Pennsylvania Ave. (4607M), N.W.

Washington, D.C. 20460

Phone: 202-564-2766

From: Christ, Lisa
Sent: Wednesday, February 11, 2015 3:21 PM
To: Ellis, Jerry
Cc: Hernandez-Quinones, Samuel
Subject: RE: Radiation PAGs, Communications strategy templates

Hi Jerry –

Please use the long form. We will need to do specific outreach to the drinking water sector that will not be in an ORIA outreach plan. We will also need to craft key messages for OW to use specific to drinking water.

Thanks-

Lisa

From: Ellis, Jerry
Sent: Wednesday, February 11, 2015 2:24 PM
To: Christ, Lisa
Cc: Hernandez-Quinones, Samuel
Subject: Radiation PAGs, Communications strategy templates

Hi Lisa,

Steph Flaharty recommended that I use the short form since ORIA is the lead office on the PAGs. I can modify the short form by adding needed sections such as "anticipated reactions" and list of stakeholder recipients. Also we can show attachments for internal and external FAQs. Our communications strategy will be reviewed and signed by our communications staff in OGWDW.

Jerry L. Ellis, Jr.

Environmental Scientist

U.S. Environmental Protection Agency

Standards and Risk Management Division

Office of Ground Water and Drinking Water

1200 Pennsylvania Ave. (4607M), N.W.

Washington, D.C. 20460

Phone: 202-564-2766

To: Burneson, Eric[Burneson.Eric@epa.gov]; Oshida, Phil[Oshida.Phil@epa.gov]; Christ, Lisa[Christ.Lisa@epa.gov]
Cc: Clark, Becki[Clark.Becki@epa.gov]; Greene, Ashley[Greene.Ashley@epa.gov]
From: Grevatt, Peter
Sent: Sat 2/14/2015 1:17:36 AM
Subject: Fwd: PAG suggested edits
2-4-15 Draft Chapter Drinking Water PAG SHQ grevatt_comments.docx
ATT00001.htm

Thanks to the team for all of their work on this. Please see my suggested edits in the attachment for clarity and a few pict questions and comments. Please take a careful look and let me know if any of my suggestions are unclear or in error. Thanks, P.G.

Sent from my iPhone

Begin forwarded message:

> **From:** Peter Grevatt <pc_grev@yahoo.com>
> **Date:** February 13, 2015 at 7:39:04 PM EST
> **To:** "grevatt.peter@epa.gov" <grevatt.peter@epa.gov>
> **Subject: PAG suggested edits**
> **Reply-To:** Peter Grevatt <pc_grev@yahoo.com>

To: Christ, Lisa[Christ.Lisa@epa.gov]
From: Burneson, Eric
Sent: Fri 2/13/2015 8:47:00 PM
Subject: FW: A question -- FW: A request -- FW: Rads PAG
2-4-15 Draft Chapter Drinking Water PAG SHQ.docx
ATT00001.htm

From: Greene, Ashley
Sent: Friday, February 13, 2015 3:46 PM
To: Burneson, Eric; Oshida, Phil
Subject: Fwd: A question -- FW: A request -- FW: Rads PAG

This is the version I sent to Peter. It's the last one that was sent to me.

Thanks,

Ashley

Sent from my iPhone

Begin forwarded message:

> **From:** "Oshida, Phil" <Oshida.Phil@epa.gov>
> **Date:** February 11, 2015 at 3:23:30 PM EST
> **To:** "Greene, Ashley" <Greene.Ashley@epa.gov>
> **Cc:** "Burneson, Eric" <Burneson.Eric@epa.gov>
> **Subject: A question -- FW: A request -- FW: Rads PAG**
>
> Ashley,
>
> We're hoping to get a "go ahead" from Peter.
>
> Any signal from him yet?

-Phil-

From: Oshida, Phil
Sent: Tuesday, February 10, 2015 9:23 AM
To: Ashley Greene
Subject: A request -- FW: Rads PAG

February 10, 2015

Ashley,

We want to give Peter the opportunity to review this 17 page draft of the chapter – Protective Action Guide for Drinking Water. As Peter knows, this chapter presents guidance for protection of the public in the event of a radiological incident that affects drinking water supplies.

The next step for EPA is to provide this draft chapter to the radiation PAG interagency subcommittee (EPA, FEMA, DHS, NRC, DOE) for review and comment.

Eric Burneson, Lisa Christ, and ORIA management (Divison Director) have reviewed the chapter and think it is ready for subcommittee review.

Please let us know if Peter wishes to review the chapter before we send it back to ORIA for transmittal to the PAG subcommittee, or he would be comfortable reviewing it concurrently with the subcommittee.

Thanks.

-Phil-

From: Christ, Lisa
Sent: Tuesday, February 10, 2015 8:47 AM
To: Oshida, Phil
Subject: Rads PAG

Eric and I reviewed the document as well as ORIA management (DD level). The attached document is ready to go to the Radiation PAG inter-agency subcommittee comprised of representatives from EPA, FEMA, DHS, NRC, DOE. We would like to provide it to the subcommittee this Thursday for their review.

~~~~~~

Lisa Christ, Chief

Targeting and Analysis Branch

Office of Ground Water and Drinking Water

USEPA

1200 Pennsylvania Ave NW
Washington, DC 20460-0001
phone: 202.564.8354
fax: 202.564-3760

Mail Code: 4607M
~~~~~~

To: Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]; Christ, Lisa[Christ.Lisa@epa.gov]; Ellis, Jerry[Ellis.Jerry@epa.gov]
Cc: Huff, Lisa[Huff.Lisa@epa.gov]
From: Burneson, Eric
Sent: Fri 2/13/2015 2:03:56 PM
Subject: RE: PAGs

That's okay Sam, Lisa took my comments and incorporated them. I can scan the hard copy she gave me if no one else has the electronic version.

-----Original Message-----
From: Hernandez-Quinones, Samuel
Sent: Friday, February 13, 2015 9:03 AM
To: Burneson, Eric; Christ, Lisa; Ellis, Jerry
Cc: Huff, Lisa
Subject: Re: PAGs

Hi Eric,

I do not have a markup of your comments. I can send you the original electronic file that I submitted to Lisa last week.

If you send me your comments I can incorporate into the file.

Thank You
Sam

==
Samuel Hernández Quiñones, P.E.
Environmental Engineer
Environmental Protection Agency
Office of Water
1200 Pennsylvania Ave. NW
Washington, DC 20460
202-564-1735
"USEPA Protecting Human Health and the Environment"

From: Burneson, Eric
Sent: Friday, February 13, 2015 8:50 AM
To: Christ, Lisa; Hernandez-Quinones, Samuel; Ellis, Jerry
Cc: Huff, Lisa
Subject: FW: PAGs

Lisa handed me a hard copy of the revised PAG yesterday, incorporating comments I gave on Tuesday. However I don't seem to have an electronic version. Do any of you have one?

-----Original Message-----
From: Grevatt, Peter
Sent: Friday, February 13, 2015 8:29 AM
To: Oshida, Phil; Burneson, Eric
Cc: Greene, Ashley
Subject: PAGs

Can one if you please send me an electronic version of the pags DW chapter to review?

Sent from my iPhone

To: Christ, Lisa[Christ.Lisa@epa.gov]
From: Hernandez-Quinones, Samuel
Sent: Wed 2/4/2015 7:51:41 PM
Subject: RE: status
2-4-15 Draft Chapter Drinking Water PAG SHQ .docx

Here is the updated file.

Sam

==

Samuel Hernández Quiñones, P.E.
Environmental Engineer
Environmental Protection Agency
Office of Water
1200 Pennsylvania Ave. NW
Washington, DC 20460
202-564-1735

"USEPA Protecting Human Health and the Environment"

From: Christ, Lisa
Sent: Wednesday, February 04, 2015 2:46 PM
To: Hernandez-Quinones, Samuel
Subject: RE: status

Thanks Sam –

Hey there's a comment bubble on page 6, can you please remove it? It can't seem to get it to go away…

Lisa

From: Hernandez-Quinones, Samuel
Sent: Wednesday, February 04, 2015 2:20 PM
To: Christ, Lisa
Subject: RE: status

Hi Lisa,

Here is the revised draft Chapter for Peter's Review.

Sam

==

Samuel Hernández Quiñones, P.E.
Environmental Engineer
Environmental Protection Agency
Office of Water
1200 Pennsylvania Ave. NW
Washington, DC 20460
202-564-1735

"USEPA Protecting Human Health and the Environment"

From: Christ, Lisa
Sent: Wednesday, February 04, 2015 9:53 AM
To: Hernandez-Quinones, Samuel
Subject: RE: status

Hi Sam,

Since Eric and I will be out tomorrow and Friday at the NDWAC meeting it would be great to get the report early afternoon so we can offer Petter the chance to review.

Thanks-

Lisa

From: Hernandez-Quinones, Samuel
Sent: Monday, February 02, 2015 9:06 AM
To: Christ, Lisa
Subject: Re: status

Hi Lisa,

I will have the Revised Radon letter ready for you today.

I have a few items still unresolved for the PAG chapter, but I think we can have the Chapter ready for Peter by Wednesday.

Sam

==

Samuel Hernández Quiñones, P.E.
Environmental Engineer
Environmental Protection Agency
Office of Water
1200 Pennsylvania Ave. NW
Washington, DC 20460
202-564-1735

"USEPA Protecting Human Health and the Environment"

From: Christ, Lisa
Sent: Monday, February 2, 2015 8:10 AM
To: Hernandez-Quinones, Samuel
Subject: status

Hi Sam,

I received a voicemail from Lee asking about the PAG chapter. When will the revisions to the chapter be complete? I don't know if Peter will want to review the chapter before the Inter-Agency group, but I'd like to give him the opportunity.

Also, have you sent the radon letter to Puerto Rico?

Thanks-

Lisa

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Lisa Christ, Chief

Targeting and Analysis Branch

Office of Ground Water and Drinking Water

USEPA

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Mail Code: 4607M
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

To: Christ, Lisa[Christ.Lisa@epa.gov]
From: Hernandez-Quinones, Samuel
Sent: Wed 1/28/2015 6:20:53 PM
Subject: RE: bullets for OW

Hi Lisa,

Please see the Bi-Weekly input below.

Sam

Radiation Protective Action Guides – Drinking Water – TAB staff briefed the Radiation Protective Action Guides Interagency Sub-Committee Group on January 22, 2015. The group was composed of representatives from several Federal Agencies including DOE, FEMA, FDA, NRC, DOD & EPA among others. During the briefing TAB staff talked about its proposed approach and assumptions used in the preliminary development of a drinking water PAG. The group was generally receptive of TABs proposed approach and no objections were voiced by the group. TAB will continue discussions with the Interagency Sub-Committee Group as EPA finalizes its PAG proposal.

TAB is closely coordinating with Office of Air the development and interactions with the interagency group. On April 15, 2013 EPA published Draft Protective Action Guides and requested comments on the proposed PAGs. No specific drinking water PAG was proposed at the time, EPA expects to propose a drinking water PAG by Fall of 2015. (Sam H. - 564-1735)

==

Samuel Hernández Quiñones, P.E.
Environmental Engineer
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202-564-1735

"USEPA Protecting Human Health and the Environment"

From: Christ, Lisa
Sent: Tuesday, January 27, 2015 2:22 PM
To: Christ, Lisa; Damico, Brian; Ellis, Jerry; Forrest, Kesha; Fultz, Christopher; Helm, Erik; Hernandez-Quinones, Samuel; Kempic, Jeffrey; Khera, Rajiv; Olson, Daniel; Perkinson, Russ; Regli, Stig; Robinson, Matt M.; Russell, Meredith; Smith, Lameka; Townsend, Clifton; Wirth, Karen
Cc: Huff, Lisa
Subject: bullets for OW

Dear All,

Please send me bullets for Peter to share with Ken and other ODs at staff meeting. I need them by COB tomorrow.

Thanks-

Lisa

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Lisa Christ, Chief

Targeting and Analysis Branch

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To: DeCair, Sara[DeCair.Sara@epa.gov]; Christ, Lisa[Christ.Lisa@epa.gov]
From: Veal, Lee
Sent: Wed 1/21/2015 9:17:50 PM
Subject: RE: EPA Advice Needed for water guide in July nuclear plant exercise

Lisa and Sara,

Oh this is very interesting indeed. For background, South Carolina is preparing for a large exercise in July. They have adopted the PAGs published for interim use, actually incorporating the new language into their nuclear power plant response plans, and are obviously trying to figure out what to do with drinking water in their planning. I think it too early to talk to SC about what might be in our draft drinking water PAG but clearly conferring with the Subcommittee, which includes lots of Advisory Team members is smart.

As Lisa noted, drinking water systems would continue to need to comply with SDWA requirements. There are a lot of individual wells in this part of SC (near the exercise location), however, which are not covered by SDWA if memory serves, but having a marker like a PAG and MCL would provide a good resource.

Lee

-----Original Message-----
From: DeCair, Sara
Sent: Wednesday, January 21, 2015 2:33 PM
To: Veal, Lee; Christ, Lisa
Subject: EPA Advice Needed for water guide in July nuclear plant exercise

Lee, Lisa;

RaJah is probably hoping for a fairly quick opinion or guidance on this interesting question. John Griggs published this Analysis Guide right when we were quite sure the old Water PAG would be in an EPA PAG Manual very soon, in fact he didn't cite the DHS RDD/IND guide's mention of a water PAG instead. He has reminded me that the document doesn't tell you which value to use, just provides considerations for analyzing to various benchmarks between PAG levels and MCLs. I know OW supports this document, but it doesn't exactly constitute clear federal guidance on what to use for a PAG in a nuclear plant exercise, which South Carolina has probably thought about and is asking for help.

The Advisory Team will weigh in, which is good, since it is an area of fuzziness for now. Tomorrow, if we have time, the PAGs Subcommittee might mention this since some of the same people are on both groups. I thought I'd get this in front of you two first, so you can think about what we might say. I am glad to draft an answer including these caveats and help shape the Advisory Team input.

Thanks!

Sara

From: Mena, Rajah [MenaRM@nv.doe.gov]

Sent: Wednesday, January 21, 2015 12:26 PM

To: DeCair, Sara; Dempsey, Gregg D.

Cc: Dixon, John E. (CDC/ONDIEH/NCEH); Sincek, Jeffrey (FDA) ; Smallwood, Karen R; John Aucott (John.Aucott@dm.usda.gov); Sandra Threatt; Pemberton, Wendy; Hunt, Brian; Kraus, Terrence D

Subject: Advisory Team/EPA Advice Needed in Support of Southern Exposure 15

Good Morning,

In discussions this morning with the Public Health and Environment WG the topic of drinking water regulations was raised. The state is presently using the EPA guidance document attached for dose limits with respect to consumption of drinking water. It is our experience that states differ in guidance used in this situation. Some treat water as food, applying the DILs as described in the FDA PAG manual for other food types. Some adhere to the SDWA creating radionuclide concentration limits that will relate to the 4 mrem dose. My questions to you are as follows:

1. Is there an issue with South Carolina using the guidance attached?

2. Is there a general consensus or rule with respect to drinking water which should be applied nationwide?

Jeff,

I don't have your A-Team distribution list so please feel free to forward to the group as appropriate.

Thanks in advance for your help!

RaJah Mena, CHP

Senior Scientist

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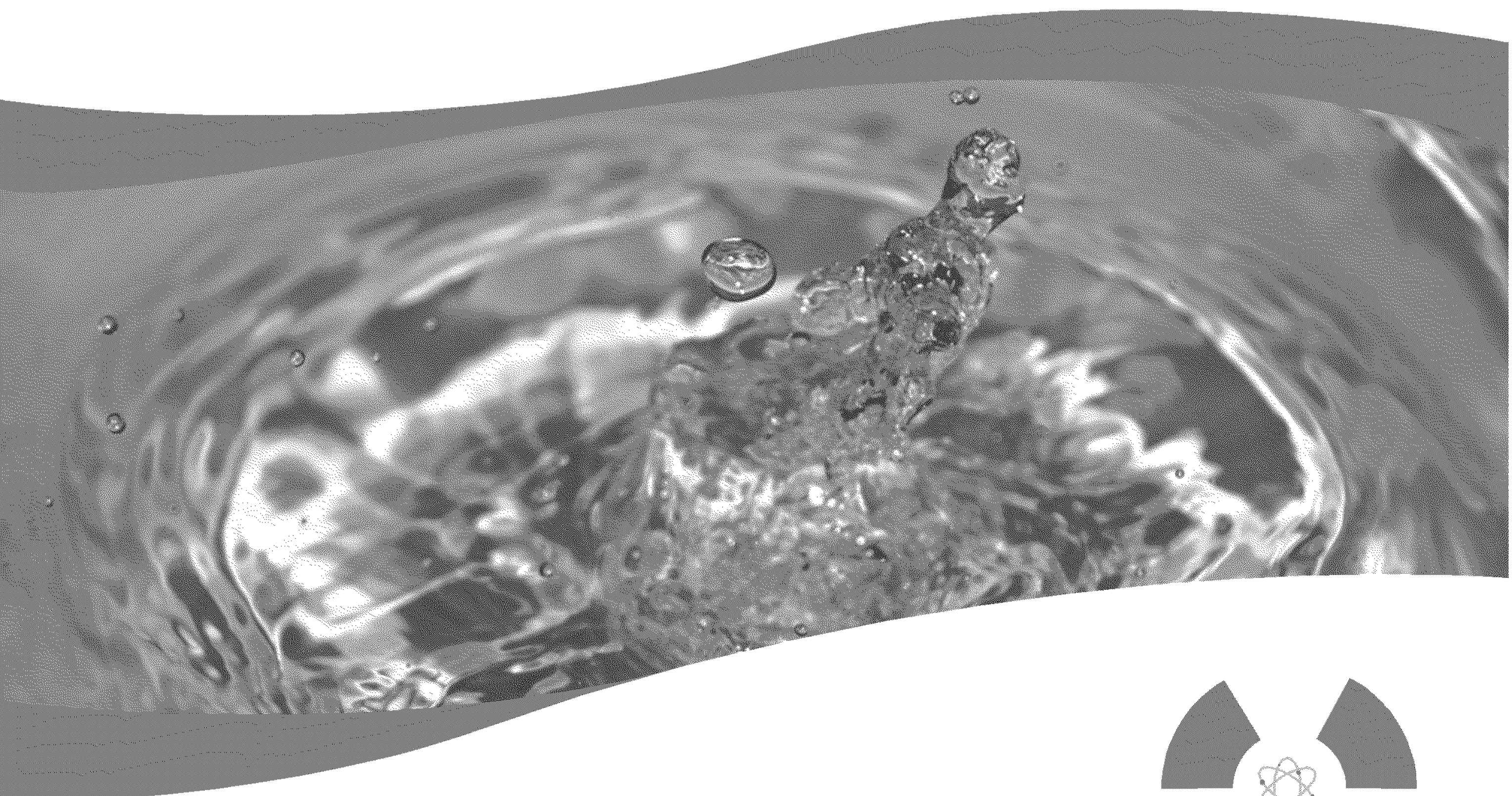
United States
Environmental Protection
Agency

Office of Radiation and Indoor Air
National Air and Radiation
Environmental Laboratory

EPA 402-R-07-007
January 2008
www.epa.gov/narel

Radiological Laboratory Sample Analysis Guide for Incidents of National Significance – Radionuclides in Water



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Revision 0

Radiological Laboratory Sample Analysis Guide for Incidents of National Significance — Radionuclides in Water

U.S. Environmental Protection Agency
Office of Air and Radiation
Office of Radiation and Indoor Air
National Air and Radiation Environmental Laboratory
Montgomery, AL 36115

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Preface

The document describes the likely analytical decision paths that would be required by personnel at a radioanalytical laboratory following a radiological or nuclear incident, such as that caused by a terrorist attack. EPA's responsibilities, as outlined in the *National Response Plan Nuclear/ Radiological Incident Annex*, include response and recovery actions to detect and identify radioactive substances and to coordinate federal radiological monitoring and assessment activities. This document was developed to provide guidance to those radioanalytical laboratories that will support EPA's response and recovery actions following a radiological or nuclear Incident of National Significance (INS).

The need to ensure adequate laboratory infrastructure to support response and recovery actions following an INS has been recognized by a number of federal agencies. The Integrated Consortium of Laboratory Networks (ICLN), created through a memorandum of understanding in 2005 by ten federal agencies, consists of existing and emerging laboratory networks across the Federal Government. ICLN is designed to provide a national infrastructure with a coordinated and operational system of laboratory networks that provide timely, high quality, and interpretable results for early detection and effective consequence management of acts of terrorism and other events requiring an integrated laboratory response. It also designates responsible federal agencies (RFAs) to provide laboratory support across response phases for chemical, biological, and radiological agents. To meet its RFA responsibilities for environmental and drinking water samples, EPA is developing the Environmental Laboratory Response Network (eLRN). As an RFA for radiological agents, eLRN will be responsible for monitoring, surveillance, and remediation, and will share responsibility for incident response with the Department of Energy. As part of eLRN, EPA's Office of Radiation and Indoor Air is leading an initiative to ensure that sufficient environmental radioanalytical capability and competency exists across a core set of laboratories to carry out EPA's designated RFA responsibilities.

Three radioanalytical scenarios, responding to two different public health questions, address the immediate need to determine the concentration of known or unknown radionuclides in water. The scenarios are based upon the radionuclides that probably would be released by a radiological dispersion device or those that may be released intentionally into the drinking water supply. The first analytical scenario assesses whether water samples pose immediate threats to human health and warrant implementation of protective measures specific to radiation concerns. The second assesses whether specific water sources (samples) are potable based on current national drinking water standards. The third situation assumes that the radioactive contaminants are known, and a shortened version of the first two analytical scenarios is used to help expedite the analysis process. Use of established analytical schemes will increase the laboratory efficiency so that large numbers of samples can be analyzed in a timely manner. The use of the analytical schemes and the associated measurement quality objectives also will ensure that the radioanalytical data produced will be of known quality appropriate for the intended incident response decisions.

As with any technical endeavor, actual radioanalytical projects may require particular methods or techniques to meet specific measurement quality objectives. The document cannot address a complete catalog of analytical methodologies or potential radionuclides. Radiochemical methods to support response and recovery actions following a radiological or nuclear INS can be found in

Standardized Analytical Methods for Environmental Restoration following Homeland Security Events, Revision 3 (EPA 600-R-07-015).

Detailed guidance on recommended radioanalytical practices may be found in current editions of the *Multi-Agency Radiological Laboratory Analytical Protocols Manual* (MARLAP) and the *Multi-Agency Radiation Survey and Site Investigation Manual* (MARSSIM), both referenced in this document. EPA is developing companion documents for air and soil samples. Familiarity with Chapters 2 and 3 of MARLAP will be of significant benefit to the users of this guide.

Comments on this document, or suggestions for future editions, should be addressed to:

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This report was prepared for the National Air and Radiation Environmental Laboratory of the Office of Radiation and Indoor Air, United States Environmental Protection Agency. It was prepared by Environmental Management Support, Inc., of Silver Spring, Maryland, under contract 68-W-03-038, work assignments 21 and 35, managed by David Garman. Mention of trade names or specific applications does not imply endorsement or acceptance by EPA.

Acknowledgments

This manual was developed by the National Air and Radiation Environmental Laboratory (NAREL) of EPA's Office of Radiation and Indoor Air (ORIA).

Dr. John Griggs served as project lead for this document. Several individuals provided valuable support and input to this document throughout its development. Special acknowledgment and appreciation are extended to Dr. Keith McCroan, ORIA/NAREL; Ms. Lindsey Bender, ORIA/ Radiation Protection Division (RPD); Dr. Lowell Ralston and Mr. Edward Tupin, CHP, both of ORIA/RPD; Ms. Schatzi Fitz-James, Office of Emergency Management, Homeland Security Laboratory Response Center; and Mr. David Garman, ORIA/NAREL. Numerous other individuals both inside and outside of EPA provided peer review of this document, and their suggestions contributed greatly to the quality and consistency of the final document. Technical support was provided by Dr. N. Jay Bassin, Dr. Anna Berne, Dr. Carl V. Gogolak, Dr. Robert Litman, Dr. David McCurdy, and Mr. Robert Shannon of Environmental Management Support, Inc.

Contents

Figures

Tables

Acronyms, Abbreviations, Units, and Symbols

(Excluding chemical symbols and formulas)

" .... alpha particle

" .... probability of a Type I decision error

AAL .... analytical action level

ADL .... analytical decision level

AS .... alpha spectrometry

\$ .... beta particle

\$ .... probability of a Type II decision error

Bq .... becquerel (1 dps)

CERCLA .... Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (“Superfund”)

CFR .... *Code of Federal Regulations*

cm .... centimeter

cpm .... counts per minute

d .... day

DL .... discrimination limit

DOE .... United States Department of Energy

DP .... decay product(s)

dpm .... disintegrations per minute

dps .... disintegrations per second

DQO .... data quality objective

DRP .... discrete radioactive particle

DWC .... derived water concentration

e^- .... electron

$E_{\$max}$ .... maximum energy of the beta-particle emission

EDD .... electronic data deliverable

EPA .... United States Environmental Protection Agency

(........... gamma ray

g .... gram

Ge .... germanium semiconductor

GM .... Geiger-Mueller detector

GP .... gas proportional

GPC .... gas proportional counting/counter

GS .... gamma spectrometry

Gy .... gray

h .... hour

H_0 .... null hypothesis

H_1 .... alternate hypothesis

HPGe .... high-purity germanium [detector]

IC .... Incident Commander

ICC .... Incident Command Center

IND .... improvised nuclear device (i.e., a nuclear bomb)

INS .... incident of national significance

keV .... thousand electron volts

L .... liter

LBGR .... lower bound of the gray region
LEPD .... low energy photon detector
LS .... liquid scintillation
LSC .... liquid scintillation counter/counting
MARLAP .... *Multi-Agency Radiological Laboratory Analytical Protocols Manual*
MARSSIM ... *Multi-Agency Radiation Survey and Site Investigation Manual*
MCL .... maximum contaminant level
MeV........ million electron volts
mg .... milligram (10^{-3} g)
mL .... milliliter (10^{-3} L)
mrem .... millirem (10^{-3} rem)
µg .... microgram (10^{-6} g)
µR .... microroengten
MDC .... minimum detectable concentration
min......... minute
MQO .... measurement quality objective
NaI(Tl) ...... thallium-activated sodium iodide detector
φ_{MR} .... relative required method uncertainty
PAG .... protective action guide
pCi .... picocurie (10^{-12} Ci)
QA .... quality assurance
QC .... quality control
R........... roentgten
rad......... radiation absorbed dose
RDD .... radiological dispersal device (i.e., "dirty bomb")
RDL .... required detection limit
REGe .... reverse electrode germanium [detector]
rem......... roentgen equivalent man
s .... second
SDWA ...... Safe Drinking Water Act
SOP .... standard operating procedure
Sv .... sievert
TEDA .... triethylenediamine
TEDE .... total effective dose equivalent
UBGR ...... upper bound of the gray region
u_{MR} .... required method uncertainty
y .... year

Radiometric and General Unit Conversions

To Convert	To	Multiply by	To Convert	To	Multiply by
years (y)	seconds (s) minutes (min) hours (h) days (d)	3.16×10^{7} 5.26×10^{5} 8.77×10^{3} 3.65×10^{2}	s min h d	y	3.17×10^{-8} 1.90×10^{-6} 1.14×10^{-4} 2.74×10^{-3}
disintegrations per second (dps)	becquerels (Bq)	1	Bq	dps	1
Bq Bq/kg Bq/m^3 Bq/m^3	picocuries (pCi) pCi/g pCi/L Bq/L	27.0 2.70×10^{-2} 2.70×10^{-2} 10^{3}	pCi pCi/g pCi/L Bq/L	Bq Bq/kg Bq/m^3 Bq/m^3	3.70×10^{-2} 37.0 37.0 10^{-3}
microcuries per milliliter (: Ci/mL)	pCi/L	10^{9}	pCi/L	: Ci/mL	10^{-9}
disintegrations per minute (dpm)	: Ci pCi	4.50×10^{-7} 4.50×10^{-1}	pCi	dpm	2.22
gallons (gal)	liters (L)	3.78	L	gal	0.264
gray (Gy)	rad	10^{2}	rad	Gy	10^{-2}
roentgen equivalent man (rem)	sievert (Sv)	10^{-2}	Sv	rem	10^{2}

Note: Traditional units are used throughout this document instead of SI units. Protective Action Guides (PAGs) and their derived concentrations appear in official documents in the traditional units and are in common usage. Conversion to SI units will be aided by the unit conversions in this table. Conversions are exact to three significant figures, consistent with their intended application.

I. INTRODUCTION

This guide deals with the analysis of water samples that may have been contaminated as the result of a radiological or nuclear event, such as a radiological dispersion device (RDD), improvised nuclear device (IND), or an intentional release of radioactive materials into a drinking water supply. In the event of a major incident that releases radioactive materials to the environment, EPA will turn to selected radioanalytical laboratories to support its response and recovery activities. In order to expedite sample analyses and data feedback, the laboratories will need guidance on EPA's expectations.

A response to a radiation release to the environment likely will occur in three phases: "early," "intermediate," and "recovery." Each phase of an incident response will require different and distinct radioanalytical resources to address the different consequences, priorities, and requirements of each phase. Some of the more important radioanalytical laboratory resources germane to incident response and recovery consist of radionuclide identification and quantification capability, sample load capacity, sample processing turnaround time, quality of analytical data, and data transfer capability.

The early phase begins at the initial event and lasts for three or four days, during which data are scarce, and pre-planned dispersion models are used. During this phase, responders are primarily concerned with evacuating people, sheltering them in place, or restricting use of specific water supplies. The purpose of the actions and evaluations taken during the early phase is to minimize exposure and to prevent acute health effects. The Protective Action Guides (PAGs) for radiological emergencies require evacuation of a population if the projected short-term total effective radiation dose equivalent[1] (TEDE) exceeds 5 rem.[2] The nominal trigger for sheltering is 1–5 rem over four days (projected avoided total effective dose). The radioanalytical resource requirements (field or fixed laboratory) for this early phase may vary significantly depending on the timeframe, source term radionuclide and the extent of the contamination.

The intermediate phase begins when no more radiation releases are expected, and the source term contamination radionuclides have been qualitatively identified. In this phase, radionuclide concentrations, extent of the contaminated zone, and matrices (air, water, soil) required for analysis may not be well defined. The radioanalytical resources needed will depend on the radionuclide analytical action levels (AAL) developed for the various media important to human exposure. The AAL may change depending upon the stage of the event, the appropriate PAGs, or risk values. The radionuclide derived water concentrations (DWCs) are based on the PAGs or risk values. For the intermediate phase, PAGs have been established to limit the projected radiation doses for different exposure periods; not to exceed 2-rem TEDE over the first year, 500-mrem TEDE during the second year, or 5 rem over the next 50 years (including the first and second years of the incident). In addition, radionuclide concentration limits for food and water as regulated by the Food and Drug Administration and EPA would be applicable.

[1]The sum of the effective dose equivalent (for external exposure) and the committed effective dose equivalent (for internal exposure). TEDE is expressed in units of sievert (Sv) or rem.

[2]The common unit for the effective or "equivalent" dose of radiation received by a living organism, equal to the actual dose (in rads) multiplied by a factor representing the danger of the radiation. "rem" stands for "roentgen equivalent man," meaning that it measures the biological effects of ionizing radiation in humans. One rem is equal to 0.01 Sv.

The final, or "recovery," phase occurs as part of a radiological incident site- or drinking-water-supply remediation effort. During this final phase, when site- or drinking-water-supply characterization and remediation cleanup effectiveness is determined, there is a potential for more extensive radiochemical analyses at the lowest radionuclide concentrations. Applicable drinking water regulations for radionuclides (40 CFR Parts 9, 141, 142) may be used during this phase.

During all phases of an incident response, radioanalytical resources are needed for identifying the radionuclide source terms, quantification of the radionuclides in a variety of media, and the gross radiation screening of samples for prioritization of sample processing or for information related to the general level of contamination. This guide has been developed to provide the Incident Commander (IC) and the laboratories selected to analyze samples during an incident with a logical processing scheme to prioritize sample processing in relation to the radionuclide derived water concentrations corresponding to established PAGs or Maximum Contaminant Levels (MCLs) under the Safe Drinking Water Act.

A. Objectives

This document is intended to assist those analytical laboratories that will be called upon to provide rapid support to Agency personnel following a radiological or nuclear incident. Because EPA recognizes that in the immediate and intermediate period following such a release, there may not be sufficient time for the Incident Command Center (ICC) to coordinate and communicate complete data quality objectives, measurement quality objectives, and analytical priorities to the laboratory, this document will enable laboratories to proceed with a consistent approach to developing and reporting appropriate data suitable for the anticipated use.

The ultimate purpose of the screening process described in this guide is to ensure that public health is protected. The recommendations in this guide are based upon EPA's PAGs and applicable drinking water regulations for radionuclides (40 CFR Parts 9, 141, and 142, *National Primary Drinking Water Regulations; Radionuclides*; Final Rule. *Federal Register* 65:76707-76753, December 7, 2000).

This document presents a series of three analytical scenarios to aid laboratories in establishing priorities for analyzing samples received during the response to a radiological or nuclear incident. The following table summarizes the relevant responsibilities of the IC and the laboratory manager during such a response.

Information Provided...	Sample Priority	Method Uncertainty	Miscellaneous MQOs	Reporting (Results and Anomalies)	Analyte Selection	Turnaround Time Compliance	Procedure Selection
By:	IC	IC	IC	Lab	IC	Lab	Lab
To:	Lab	Lab	Lab	IC	Lab	IC	IC

One of the key objectives in this document is to explain the responsibilities indicated above in terms of analytical processes. While the IC should provide the necessary information (analytes, matrices, measurement quality objectives) that define the scope of the laboratory's processing requirements and results, the laboratory should ensure that the methods used have been validated and will meet the required measurement quality objectives (MQOs) and the required turnaround time. It is possible that immediately following such an event, especially when MQOs may not have been established or provided, laboratories may receive samples without complete documentation or direction. In such cases, laboratories may follow the procedures and examples in this document, and be confident that their results should provide reasonable and consistent results.

This document is not meant to replace any field monitoring decisions on sample prioritization. It is intended as a guide on how to establish priorities for samples received at the laboratory at different times throughout the response, and it should provide to the IC the basis for understanding the nature and limitations of the data received from the laboratories. Familiarity with Chapters 2 and 3 of MARLAP will be of significant benefit to the users of this guide.

B. Scope and Radiological Scenarios

Radiological incidents can be subdivided into three phases: early (onset of the event to about Day 4), intermediate (about Day 4 to about Day 30), and recovery (beyond about Day 30). This guide concentrates on the time from the end of the early phase, through the intermediate phase and into the recovery phase. During the early phase, analytical priorities need to address the protection of the public and field personnel due to potentially high levels of radioactivity, and to provide for *qualitative* identification of radionuclides. During the intermediate phase, the radionuclides and matrices of concern are known *qualitatively*, and the *quantitative* levels suitable for making decisions based on analytical action levels need to be rapidly determined. The phase of an incident where this document will find its greatest utility is early in the intermediate phase through the end of the recovery phase. Laboratories performing analyses must focus on rapid turnaround of sample results and optimized sample analysis so that the initial qualitative aspects and concentrations related to the appropriate AALs can be determined quickly. During the recovery phase, the screening techniques used for samples will be of less significance because the radionuclides from the event are likely to have been characterized already. This is represented by the lower portions of the flow-charts, which address analyses of specific radionuclides. Potable water supplies will be evaluated against MCLs during this recovery phase.

Three distinct radioanalytical scenarios are presented for water potentially contaminated with radionuclides. The first two assume that the radionuclides are unknown.

- The first scenario is a water supply, surface, or groundwater source highly contaminated with an unknown quantity of yet unidentified radionuclides.

- The second scenario requires that the laboratory determine whether a water source from the affected areas and unknown source term is safe to drink.

- The third scenario, where the radionuclides have been identified, occurs later during the early or intermediate phases, and the laboratory need not waste analytical processing time trying to identify which radionuclides are present. The decision tree focuses on establishing the priority for processing samples based on the gross concentration screening values for the specific radionuclides.

In Radioanalytical Scenario 1, the identity of the radionuclides and potential concentrations are unknown. This is most likely to occur during the early phase of the event. The laboratory's priority is to identify all the radionuclides present and their concentrations in the water sources sampled.

The need to identify safe sources of drinking water (Radioanalytical Scenario 2) will occur later in the intermediate phase and into the recovery phase. Once all the radionuclides are identified, Radioanalytical Scenario 3 may be used for either scenario, depending upon the direction of the IC.

These scenarios may be applicable in different phases of the event, although as was previously indicated, Scenario 1 is usually the early phase and Scenario 2 is late-intermediate to recovery phase. Figure 1 depicts how these three radioanalytical scenarios relate to the response team's needs for sample prioritization.

In the third scenario, the radionuclides have been identified. This situation can arise during any of the phases, so while Figure 1 depicts Scenario 3 occurring during the later intermediate phase, Scenario 3 could occur earlier. The laboratory can save time by analyzing samples for its specific radionuclides, after it has had a gross screen to determine sample-processing priority based on its gross concentrations. Formal evaluation of other naturally occurring radionuclides may be necessary when assessing the water as a potential drinking water source.

As introduced earlier, PAGs establish radiation dose limits applicable to different phases of an incident response. The drinking water PAG (expressed as a numerical dose level) indicates a level of exposure at which protective action should be taken to prevent, reduce, or limit a person's radiation dose during a radiological incident. The derived water concentration (DWC) is the *concentration* of a radionuclide in water corresponding to the PAG dose and is used to facilitate the application of PAGs in the radioanalytical laboratory. For example, the concentration of ^{137}Cs in drinking water corresponding to the 500-mrem PAG is 5.8×10^4 pCi/L.

Similarly, radionuclide DWCs corresponding to other specific dose or risk value may be calculated and applied as required. The term "analytical action level" (AAL) will be used as a general term denoting the radionuclide concentration at which action must be taken by incident responders.

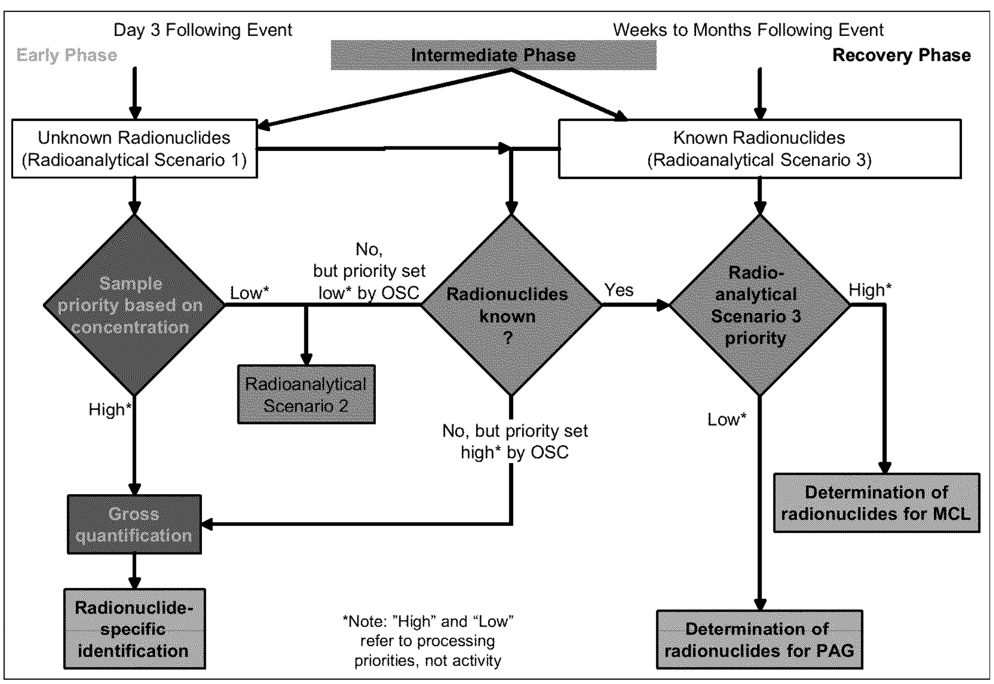

Figure 1 – Water Sample Scenarios and Response Phases

Decisions related to the processing and prioritization of specific samples will be made by laboratory personnel at the laboratory by comparing the results of radioanalytical measurements to "analytical decision level" (ADL) concentrations. Whenever the measured analyte concentration equals or exceeds the applicable ADL concentration, it will be concluded that the AAL (PAG or risk factor) has been exceeded.

When applied to prioritizing samples for processing, the ADL concentrations are always less than the corresponding AAL values by an interval calculated to provide statistical confidence when deciding whether the corresponding AAL has or has not been exceeded. The magnitude of this interval corresponds to the maximum uncertainty that would be consistent with acceptable decision error rates established during the data quality objectives (DQO)/MQO process.[1] In this process, the MQO of greatest significance is the required method uncertainty, u_{MR}. An example of a dose and its corresponding AAL, ADL, and u_{MR} is shown here for ^{226}Ra (based on tolerable Type I and Type II error rates; see details in Appendix VI):

Measurement Type	**Dose (mrem)**	**AAL[2] (pCi/L)**	**ADL (pCi/L)**	**u_{MR} (pCi/L)**
Screening[3]	100	180	90	54
Radionuclide-specific[4]	100	180	130	22

Laboratories will perform both gross activity measurements and radionuclide-specific measurements during an incident. Because different DQOs and MQOs are applicable to different types of measurements, different u_{MR} and corresponding ADL values are provided for screening and radionuclide-specific analyses. The default values for u_{MR} and corresponding ADL for screening and radionuclide-specific determinations presented in Tables 5A, 5B, 6A, and 6B provide laboratories with a starting point for developing protocols and systems for incident response activities. It is anticipated that in the case of an incident, specific DQOs and MQOs may be developed by Agency personnel to reflect the specific nature and concerns of the incident and provided to the laboratory.

Decisions related to water quality suitable for drinking are based on specific regulatory values based on the Safe Drinking Water Act (SDWA). In this case, specific values for the Maximum Contaminant Level (MCL) and the Required Detection Level (RDL) are applicable for each radionuclide, as well as gross " and $ (see Tables 7A and 7B). If more than one beta- or gamma-emitting radionuclide is present, the "sum of fractions" rule applies. This is best illustrated in the example found in Appendix II, Scenario 1, Step 15. The "sum of fractions" rule does not apply to alpha-emitting radionuclides.

The flow diagrams and corresponding numbered notes and data tables depict the analytical processing suggested for rapid response and consistency. In keeping with concepts of the *Multi-Agency Radiological Laboratory Analytical Protocols (MARLAP) Manual*, this guide does not specify analytical methods. A performance-based approach for the selection of appropriate analytical methods by the laboratory will be used to achieve MQOs specified by this document and the IC.

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[1]Appendix VI provides the derivation and detailed discussion of MQOs, required method uncertainties, and ADLs.

[2]See Appendix VI, Table 10A.

[3]Tables 5A and 5B in Appendix I summarize default ADLs and u_{MR} for screening measurements.

[4]Tables 6A and 6B in Appendix I summarize default ADLs and u_{MR} for radionuclide-specific measurements.

Radiochemical methods to support response and recovery actions following a radiological or nuclear INS can be found in *Standardized Analytical Methods for Environmental Restoration following Homeland Security Events, Revision 3* (EPA 600-R-07-015).

MQOs are statements of performance objectives or requirements for selected method performance characteristics. Method performance characteristics include the method uncertainty, the method's detection capability, the method's quantification capability, the method's range, the method's specificity, and the method's ruggedness. An example MQO for the method uncertainty at a specified concentration, such as the AAL, could be:

> "A method uncertainty of 50 pCi/L or less is required for ^{241}Am analysis at the 100-mrem AAL of 400 pCi/L."

The MQOs and any other analytical requirements serve as the basis for the laboratory's selection of a method under a performance-based approach. The laboratory should have performance data to demonstrate the method's ability to achieve the project-specific MQOs. Method validation and continued acceptable method performance assessments are essential to the performance-based approach to method selection.

This document presents a default set of MQOs. Actual MQOs, however, always will depend upon events and may need to be modified by the IC to better address a particular event. However, in order to have an analytical approach in place to address a variety of incident scenarios, the identified decision points in the accompanying flow diagrams refer to the default MQOs—primarily in the form of required method uncertainties—for analyzing the radionuclides of concern. For example, at most decision points in the diagrams where a quantitative value is given, a u_{MR} at that AAL is identified in the notes and the tables. The u_{MR} values are identified in Tables 5A, 5B, 6A, and 6B of Appendix I. Appendix VI describes the methodology used to establish the required method uncertainties identified in these tables. It is important to note that the ADL values specified in Appendix I are less than the PAGs or AALs stated in Appendix VI, Tables 10A and 10B, by the statistical factors identified in Appendix VI. In a few cases, an MQO in the form of a Required Detection Limit is used. These decision points have action limits (MCLs and RDLs) that are specified by regulation (i.e., the Safe Drinking Water Act). These are specifically identified in Tables 7A and 7B in Appendix I. In these instances, the measured value need only be less than the MCL to be within the limits of the regulation, and the sample-specific detection limit need only be less than or equal to the RDL.

Once the appropriate method has been selected, then based on the required method uncertainty or required detection limit, the laboratory can select the proper aliquant size, counting time and other parameters to meet the MQOs in the most efficient manner.

C. Analytical Response Time

Decisions regarding the extent of contamination in surface and groundwater supplies will need to be made in a timely manner. Approximate times required for laboratory processing of these samples and finalizing the sample results are shown in Appendix V. This identifies the workflow for making qualitative and quantitative measurements of high-activity contaminated water samples (Radioanalytical Scenario 1). In addition, results of the sample radioanalytical measurements needs to be communicated promptly by the laboratory to the IC so that decisions regarding movement of population, sheltering, and additional sampling can be made.

D. Implementation

It may be necessary for laboratories to incorporate key aspects of this document into their standard operating procedures. For example, the gross screening process will require specific standards and response factors for each of the instruments used by the laboratory. This could be a departure from the laboratory's current screening practice because the activity levels, sample geometries, and matrices may be significantly different from what the laboratory normally experiences.

Laboratories should become proficient with these procedures because they could be asked to respond to analytical requests in hours rather than weeks. Thus, laboratory personnel should become familiar with the recommendations and procedures, and laboratories should consider both training and actual "drills" or exercises where analytical scenarios and samples are tested during a controlled scenario. The frequency and depth of these exercises will be at the discretion of the laboratory management.

Laboratory personnel also should be cross-trained in different areas of the incident response functions. This will help to ensure sample analysis continuity throughout the length of the incident response.

Certain values are identified in the tables in this document for presumptive AALs, which may be relied upon in the absence of explicit action levels received from the Incident Command Center, so that the laboratory may begin to process samples promptly. However, these values may change based on the needs of the particular event. MQOs will be stipulated by the IC and should be communicated to the laboratory as early as possible so that analysis can meet project objectives.

E. References

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Approved *Standard Methods for the Examination of Water and Wastewater*, required for analyses under Radioanalytical Scenario 2, include the following. Analysis of the radionuclides discussed in the following section with procedures from other standard organizations may be acceptable (see 40 CFR 141.25 for alternative methods).

- 7110 Gross Alpha and Gross Beta Radioactivity (Total, Suspended, and Dissolved) (*3 methods*)
- 7120 Gamma-Emitting Radionuclides (*2 methods*)
- 7500-3H Tritium (*2 methods*)
- 7500-Cs Radioactive Cesium (*2 methods*)
- 7500-I Radioactive Iodine (*2 methods*)
- 7500-Ra Radium (*5 methods*)
- 7500-Sr Total Radioactive Strontium and Strontium-90 (*2 methods*)
- 7500-U Uranium (*3 methods*)

II. RADIONUCLIDES

Table 1 lists some of the radionuclides that are believed to be accessible and possibly could be used in a radiological dispersion device (RDD)—or "dirty bomb"—or used to contaminate a drinking water supply, and which are addressed in this report.

This list is specifically for a RDD event and the major (noninclusive) dose-related radionuclides that might be formed from the detonation of an improvised nuclear device (IND). In the case of a IND, numerous short- and long-lived fission product radionuclides will be present, requiring proper identification and quantification. Several of the radionuclides on the list have progeny that will coexist with the parents. Thus, if ^{228}Th is found, ^{224}Ra also would be present (although it is not listed). Several different radionuclides may be present even if only one RDD is used.

TABLE 1 – Radionuclides of Concern

Radionuclides Alpha Emitters		Radionuclides Beta/Gamma Emitters	
Am-241	Ra-226	Ac-227†	Mo-99†
Cm-242	Th-228	Ce-141*	P-32*
Cm-243	Th-230	Ce-144‡	Pd-103*
Cm-244	Th-232	Co-57*	Pu-241
Np-237	U-234	Co-60*	Ra-228
Po-210*	U-235	Cs-134*	Ru-103†
Pu-238	U-238	Cs-137§	Ru-106†
Pu-239	U-Nat	H-3*	Se-75*
Pu-240		I-125*	Sr-89*
		I-129†	Sr-90†
		I-131*	Tc-99*
		Ir-192*	

* No radioactive progeny or progeny not analytically useful.
† Radioactive progeny with short half-lives, and the progeny may be used as part of the detection method for the parent.
‡ Radioactive progeny not used for quantification, only screening.
§ Radioactive progeny used for quantification only, not screening.

III. DISCUSSION

In order to illustrate the typical decisions and actions to be taken by a laboratory for each scenario, examples of the three scenarios using theoretical samples and measurement results are provided in Appendices II, III, and IV. These examples represent only three of many different possible permutations, however, and should not be construed as limiting. Each example is keyed back to the steps in its respective diagram and notes.

These scenarios assume that the time period from taking the sample to the actual beginning of the analysis by the laboratory will be short (under one day). Therefore, samples received by the laboratory will not be preserved, nor will they have been filtered. Sample filtration generally should not be performed until the extent of contamination and the radionuclide identity(ies) are known. The final decision on this must be communicated to the laboratory by the IC based on the project MQOs. Should it be necessary to delay analysis for any sample for more than two days, the sample should be preserved according to the analysis protocols to be determined.

For the three scenarios discussed in this guide, it is assumed that field personnel have performed some type of radiation detection survey of the samples prior to sending them to the laboratory. If appropriate, field personnel may determine which samples are to be submitted first to the laboratory based on these survey results. The laboratory's surveys and analyses of the samples are not intended to confirm the field survey results.

Only qualified laboratories using validated radioanalytical methods (see EPA 2007b and MARLAP, Chapter 6) should be used in order to process samples in a timely and effective manner. These laboratories will have the necessary radioanalytical capability and sample-processing capacity to conduct the required gross screening and radionuclide-specific analyses defined for the radioanalytical scenarios. This guide recommends the following analytical process flow.

1. General screening based on total radiation emitted from the sample.
2. Screening based on type of radiation emitted (i.e., alpha, beta, or gamma).
3. Specific analytical techniques applied after screening indicates the most significant activities.

This sequence is used for screening in the diagrams for each radioanalytical scenario. Each decision point in the flow diagram relates to an AAL (based on a PAG DWC, regulation, or risk-based DWC) that is part of the overall analytical process. The flow diagrams for the three radioanalytical scenarios (Figures 2, 3, and 4) use simplified process-control shapes: diamonds represent decision choices, and rectangles are action or information steps. The numerical limits in the diamonds of the flow diagrams are ADLs. Many of the flow diagram shapes have numbers keyed to the notes immediately following the respective figures. Most shapes are color-coded to reflect the highest priority analytical flow path (red), intermediate (next important) flow path (green), or the lowest priority flow path (yellow) based on the time needed to return the required analytical results to the IC. The accompanying numbered notes are color-coded in the same fashion, as are the examples in Appendices II, III, and IV. Consequently, it is highly advisable to study the flow paths in color, as a black-and-white version may be confusing or ambiguous.

The screening techniques outlined in the first steps of the flowcharts assume that the laboratory maintains the necessary instrumentation and can perform the initial gross sample screening (at or immediately subsequent to sample receipt) functions identified below:

- Micro-R meters for evaluating radiation exposures and doses on low-activity samples.
- Dose-rate meters capable of detecting gamma-beta exposures and doses.
- Hand-held gross alpha frisker for assessing the alpha count rate on sample contact.
- Survey meters with appropriate alpha, beta, and gamma detector probes can be used to determine whether samples exceed the maximum dose rate that can be handled or analyzed at the laboratory.

The instrument used for gross screening analysis (mostly for (radiation) should be calibrated (pCi/net dose rate) with a ^{137}Cs source of appropriate geometry.

The laboratory also should have the instrumentation to perform radionuclide-specific analyses (e.g., high-purity germanium [HPGe] detectors for gamma and ion implanted silicon detectors for alpha spectrometry). Some of the radionuclides listed in Table 1 on page 9 (e.g., ^{103}Pd) can be detected only with a specific type of gamma-ray detector because of their low gamma-ray emission energy (60 keV is the usual lower energy for many HPGe calibrations).

Each numbered box has associated with it a note that provides additional detail for that particular part of the process. Clarification is also provided in these notes as to when parallel paths of analysis should be followed to help expedite the processing of samples.

Table 12 (Appendix VI) provides estimated counting times for LSC and GPC and the minimum detectable concentration (MDC) that can be achieved by screening a small sample aliquant for gross alpha and beta activity. The values are based on typical detector efficiency and background values for two methods, gas proportional and liquid scintillation counting. Laboratories should prepare their own MDC tables using their preferred detection method as part of their standard operating procedures (SOPs). Laboratories also should determine (in advance) whether their individual analytical protocols will need to be revised to accommodate this process.

The number of samples that will be analyzed, and their level of contamination, will be significantly higher than normal samples. Laboratories must also consider the following:

- Separate sets of procedures for sample handling and storage.
- Increasing the frequency of detector background analyses.
- Increasing the frequency of QC checks.
- Consider adjusting the QC check activity level to more closely align with the activity of the anticipated samples.
- Increasing the frequency of contamination assessments (i.e., smears/swipes) on working surfaces in the laboratory.
- Separate protocols for personnel protective equipment.
- Separate protocols for personnel and sample radiation monitoring.
- Separate storage location for high-activity samples or a large group of samples, which would increase laboratory background for detectors or personnel. This storage location may need additional shielding or be sited so as not to affect operations.

It should be noted that modern radioanalytical procedures in the United States address low ambient concentrations of environmental radionuclides normally encountered during the past 30 years. With the detonation of an RDD or IND involving radionuclides with radioactive progeny, it is possible that the radioactive equilibria involved with these progeny may have been established (depending on the time between creation of the radionuclide source to detonation or the time of detonation to sampling, or both). This means that not only will there be considerably higher concentration of the parent but of each of the progeny. Furthermore, if multiple radionuclides are involved, the cross-contamination factor during separations must be minimized, a phenomenon that current day analysts may not have previously experienced. A specific example of such a phenomenon would be the elimination of ^{140}Ba during the ^{90}Sr separation process. Many processing schemes in today's laboratories do not account for this step because many samples are collected over a period of weeks to months and provided to laboratories as composites. Routine turnaround time for ^{90}Sr analysis is 30 days. Thus, even if the 12-day ^{140}Ba radionuclide is present, it would have decayed significantly by the time the laboratory receives the sample for analysis.

IV. CROSSWALK of Data Values

The values corresponding to different terms referred to in this document are located in the tables listed below:

TABLE 2 – Crosswalk of PAG, SDWA Limits, AAL, ADL, and u_{MR} Values

	SDWA Required Limits	AAL	ADL	u_{MR}
500 mrem/100 mrem (Screening)	Tables 10A and 10B (PAGs)	—	Tables 5A and 5B	Tables 5A and 5B
100 mrem (Radionuclide Specific)	—	Tables 10A and 10B (PAGs)	Tables 6A and 6B	Tables 6A and 6B
SDWA MCL Values	Tables 7A and 7B	—	—	—
SDWA RDL Values	Tables 7A and 7B	—	—	—
DQO and MQO Derivations	—	—	Tables 9A, 9B, 11A, and 11B	Tables 9A, 9B, 11A and 11B
Estimated Counting time for MDC (based on screening analysis)	Table 12	—	—	—

EPA's Response Protocol Toolbox (EPA, 2003) provides additional recommendations concerning planning and threat management, site characterization and sampling, and sample analysis to assist utilities and state and local agencies. If laboratory protocols for normal or routine situations cannot ensure that the DQOs and MQOs are achievable with the laboratory's SOPs under emergency conditions, then a separate set of SOPs for emergency conditions will need to be developed.

V. RADIOANALYTICAL SCENARIO 1 (Identifying Samples with Highest Activities)

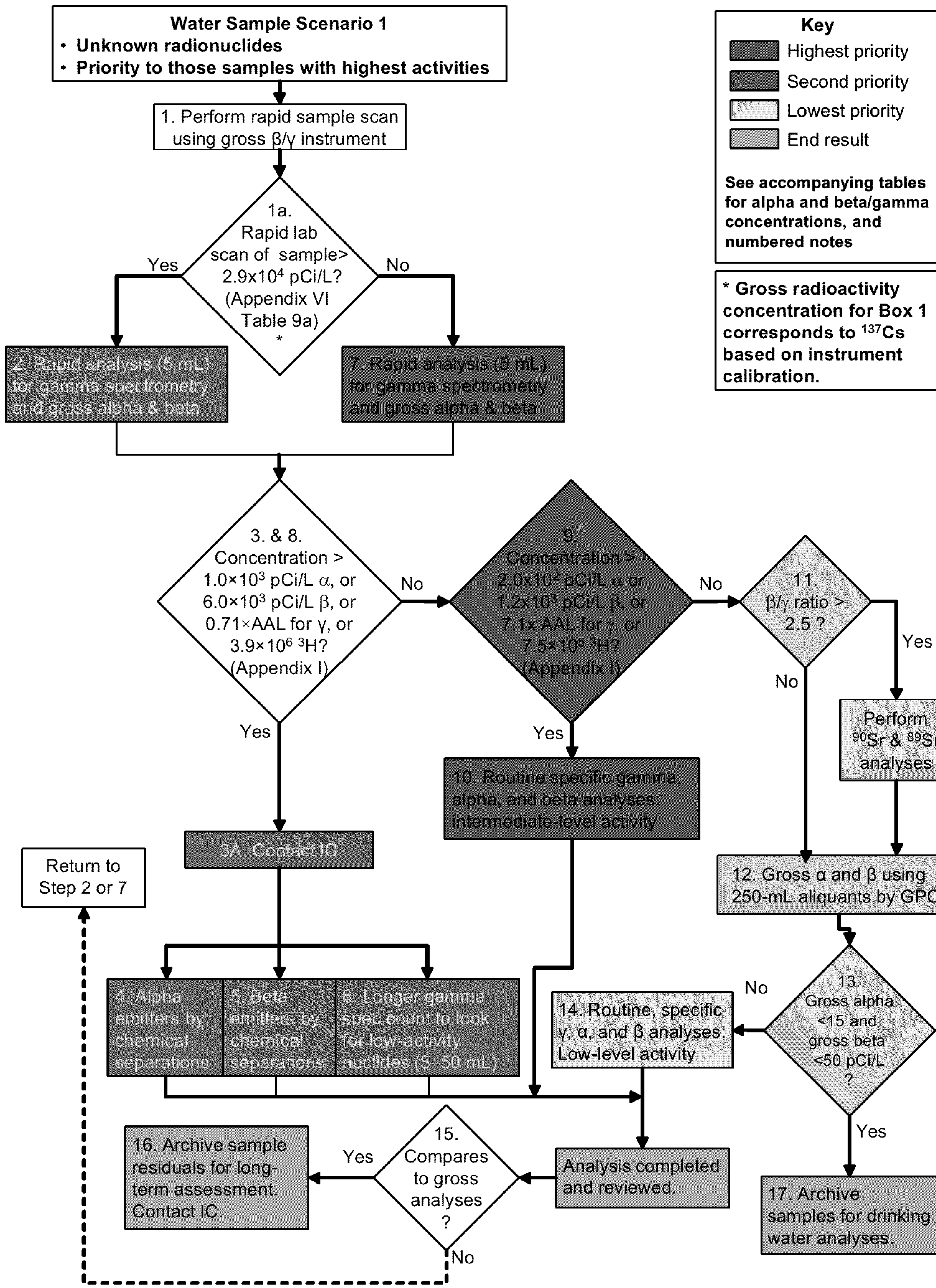

Figure 2 – Water Scenario 1 Analytical Flow

ED_001057_00006480

Notes to Scenario 1: **Contaminating Radionuclides Unknown**
Purpose: **Priority to Those Samples with Highest Activities**

Highest priority samples are all analyzed first. Only after an analytical step or procedure has been completed for the highest priority samples should lower priority samples be addressed. The samples may arrive over several days; those with the highest priority are always to be analyzed first. Lower priority samples (those following the green and yellow flow paths on this chart) may need to be stored for several days until the highest priority samples have been analyzed.

Many of the flow diagram shapes are color-coded to reflect the highest priority analytical flow path (red), intermediate (next important) flow path (green), or the lowest priority flow path (yellow) based on the time needed to return the required analytical results to the IC. The accompanying numbered notes are color-coded in the same fashion, as are the examples in Appendix II. It is highly advisable to study the flow paths in color, as a black-and-white printing may be confusing or ambiguous.

1. Analysis at this point is to assess if the 500-mrem AAL[1] values are exceeded by measurement of the sample's total gross radioactivity (concentration) with hand-held survey instruments. These might include a survey meter or Geiger-Muller (GM) counter with appropriately calibrated beta and gamma detector probes or a micro-roentgen meter (gamma only).[2] This step would most likely be performed with the sample container, unopened, leaving the determination of " ADLs to the next step. Unless the identification of the radionuclide contamination is known, the hand-held survey instrument should be calibrated using a ^{137}Cs source that would replicate the sample container geometry. The subsequent measurement should be capable of identifying a concentration from zero to 5.8×10^4 pCi/L, which is the 500-mrem AAL for ^{137}Cs. The ADL for this screening analysis is 2.9×10^4 pCi/L when applied to unknown radionuclides (see Appendix VI, Table 9A, on page 57). If the identification of the radionuclide(s) is known, the Analytical Detection Level (based on the AAL for the radionuclide listed for the 500-mrem value) is to be used (see Appendix I, Tables 5A and 5B). For survey instruments having an exposure rate readout, the instruments should be calibrated in terms of pCi/L per exposure unit readout for each container geometry expected and for the nuclide of interest, if known (^{137}Cs for unidentified nuclides).

Some laboratories may also use a calibrated NaI(Tl) detector to assess gross (activity level (using an integrated spectrum technique) and relate this measurement to a gross or radionuclide-specific (ADL.

Some gamma-emitting nuclides may not be detected at their ADLs if the sensitivity of the instrument used is inadequate. Tritium will not be detected, and beta-emitting radionuclides

[1] Depending on the time of the response, a 2-rem PAG may be applicable. If so, values for this may be obtained by scaling the PAGs and the ADLs by multiplying their corresponding 100-mrem values by 20. Thus the 2-rem PAG and ADL for ^{137}Cs would be 2.4×10^5 and 1.2×10^5, respectively.

[2] Some manufacturers have developed kits that include the survey meter plus an alpha–beta–gamma pancake GM detector and a NaI gamma detector.

that do not emit (- or X-rays may not be detected depending on the window thickness of the detector.

The initial results of these measurements need to be checked against the information in the chain-of-custody form. Communication of preliminary findings to the IC may be very valuable in helping the IC determine the areas that may need additional samples. This feedback also will reinforce the priorities assigned to each sample and further enhance decision making.

1a. If the gross activity scan yields a value greater than 2.9×10^{4} pCi/L, go to Step 2 (red path). Otherwise, go to Step 7 (green path).

> NOTE: The gross radioactivity measurements under Note 2 are evaluated against the ADLs listed in Table 5B for ^{241}Am, ^{90}Sr and ^{60}Co, respectively, at the 500-mrem level. These are not the lowest ADL values for all radionuclides. Thus, no conclusions about the presence or absence of other radionuclides should be made at this point in the analytical process.

2. If the gross ", \$, or (activities of these samples indicate that an AAL may have been exceeded (i.e., the sample activity is greater than one of these ADL values: 1.0×10^{3} alpha, or 6.0×10^{3} \$, or [0.71×AAL] for an individual (pCi/L[1]), then these analyses have the highest priority. Rapid analytical techniques, using a 5-mL sample aliquant, for " and \$ by either liquid scintillation counting (LSC)[2] or gas proportional counting (GPC) should be done to assess the individual levels of these components of the mixture. Additionally, a rapid gamma isotopic analysis needs to be performed using a HPGe detector. Note that, dependent upon the type of instrument used, the count time for some analyses may be shorter with LSC than with GPC. Screening for radionuclides such as $^{125/129/131}$I by GPC may need to be carefully performed to prevent loss of radionuclide analyte due to volatilization during sample evaporation.

Gamma isotopic analysis is performed with a high-purity germanium (HPGe) detector to identify the major (emitters. Analysis should be made on the original sample container or on an aliquant as small as 20 mL in a standardized counting geometry. The (isotopic analysis (original sample container or 20-mL aliquant) of Steps 2 and 7 using a HPGe detector and a counting time \$10 minutes should be satisfactory for achieving the required method uncertainties for the (-emitting radionuclides in Table 5B (counting time will meet both the 500- and 100-mrem ADL values).

Tritium, a potential contaminant, will not be detected by either of the gross analysis scans unless LSC is used to determine gross beta. If GPC is used for gross beta analysis, a separate aliquant of the sample will need to be analyzed for tritium. Tritium analysis should be

[1] These values are based on the ADL values for ^{241}Am and ^{90}Sr, respectively. The assumption is that the detection device is calibrated with ^{137}Cs and will yield the most representative gross activity measurement at this point in the screening process. The gamma ADL is 0.71×AAL value for any individual gamma ray emitter.

[2] LSC screening of samples typically is preferred over GPC because sample preparation of a 5-mL aliquant is much simpler, less time-consuming, and minimizes the risk of contamination. In addition, for the same counting time, LSC screening for this AAL has a better detection capability compared to GPC.

performed during this stage of the analytical process. The ADL for tritium at this stage is 3.9×10^{6} pCi/L.

3. Once the rapid analyses have been performed, the data should be reviewed to verify that the screening ADL concentrations have or have not been exceeded:

- 1.0×10^{3} " pCi/L corresponding to ^{241}Am
- 6.0×10^{3} \$ pCi/L corresponding to ^{90}Sr
- the (-specific concentrations listed
- 3.9×10^{6} for ^{3}H

(See the pCi/L values for other individual "- and \$-emitting radionuclides listed in Tables 5A and 5B).

This is particularly important for " emitters, because the previous step was the first measurement of alpha radioactivity. Note that if exceeding the ADLs is not confirmed by at least one of the three analyses, the sample analysis reverts to the second priority analysis path.

Sample analysis prioritization will be based upon which ADL is exceeded. The (analysis may help to assess which of the specific radionuclide analyses needs to be pursued with the highest priority. For example, if gross " activity exceeds the ADL and the (radionuclides identified account for the observed gross \$ activity, for which no individual \$- or (-emitting radionuclide ADL has been exceeded, priority would then shift to specific " emitters. Note in Table 5B that ^{57}Co, ^{75}Se,^{103}Pd, and ^{125}I are (-emitting nuclides only (these radionuclides decay via electron capture) and have no contribution to the results of a gross \$ analysis.

In a different example, the gross \$ indicates an ADL has been exceeded, but the gross " ADL was not exceeded. In this case, the \$ emitter analyses would take priority along with gamma spectrometry analysis. These together would identify the specific \$ components of the sample. The " analysis could be relegated to a lower priority flow path.

Some additional information may be obtained from the (-ray analysis of those radionuclides that are principally " or \$ emitters and have very low abundance (rays. These types of radionuclides may be qualitatively identified in a short count (see Table 3, page 20). Qualitative identification of (rays from those types of radionuclides may aid the laboratory in sample analysis prioritization.

High levels of \$ activity with no significant specific (component may warrant an additional GPC screening technique by using mass absorbers[1] to assess the \$-particle energy. A sample volume greater than 5 mL may be required to effectively assess the range of the particles by

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[1] A technique that has been used successfully to determine the energy of beta-only emitters is to measure the range of the beta particles in a pure material ("Feather analysis"). The ranges of beta particles in several pure materials (such as aluminum) have already been established. The units of thickness are expressed as areal density, or mg/cm^{2}. A set of aluminum absorbers of varying thickness is used, and the activity versus the absorber thickness is plotted on a semi-log scale. The linear portion of this curve is then extrapolated to find the "zero" activity thickness. This is then related to the $E_{\$max}$ of the beta particle, which will be characteristic for a particular radionuclide. A discussion of this technique can be found in *Principles of Radioisotope Methodology*, 3rd Edition, G.D. Chase and J.L. Rabinowitz, Burgess (Minneapolis) 1967.

this method. This could minimize time spent on searching for the radionuclide (see Table 4, page 21).

Following Step 3, the highest activity samples that exceed the 1.0×10^{3} or 6.0×10^{3} pCi/L ADL screening levels (gross " or \$), ^{3}H, <u>or</u> specific ADL (-emitting radionuclide concentrations, respectively, should be analyzed through Steps 4, 5, and 6 as quickly as possible. This will enable the laboratory to recalibrate its gross screening methods for those radionuclides actually found in the sample, which in turn will improve the accuracy of the gross screening techniques in assessing whether ADLs have been exceeded for subsequent samples. This also means that subsequent samples from the same location may be able to follow Radioanalytical Scenario 3 (page 28).

3a. The existence of samples exceeding the 500-mrem ADLs should be communicated to the IC as soon as possible.

> NOTE: Steps 4, 5, and 6 may be done concurrently based on the gross analysis results.

4. Chemical separation for specific " radionuclides commences if the gross " concentration exceeds the ADL (see Table 5A, page 32). Certain " emitters also emit (rays or have (-emitting decay products that may be identified in Step 3. The (results can be used to determine which " emitter analyses need not be performed immediately. For example, lack of a significant 59 keV peak in the (spectrum would indicate that an analysis for ^{241}Am does not have to be performed. If the project manager does not specify the sequence of analyses, laboratory personnel should use their best professional judgment, based on the characteristics of the samples, to determine the order of processing the samples so that the results are obtained in the most efficient manner.

5. Chemical separations to be performed for specific \$ radionuclides, not identifiable via gamma spectrometry, include ^{3}H, ^{32}P, ^{241}Pu, ^{90}Sr, and ^{89}Sr. If the project manager does not specify the sequence of analyses, laboratory personnel should use their best professional judgment, based on the characteristics of the samples, to determine the order of processing the samples so that the results are obtained in the most efficient manner.

6. The initial gamma spectrometry results will have identified high activity samples that may provide insight as to which "- or \$-only emitters are present. This longer count (compared to Step 7) and optional larger sample size should focus on lower-intensity (-ray lines from additional radionuclides. When counting is completed, the analyst should ensure that newly identified (-rays are from different radionuclides and not just low intensity lines from the predominant (emitters.

> NOTE: Once radionuclides have been identified, gross screening methods should be recalibrated to the radionuclides of interest, and the laboratory may follow the flowchart for Radioanalytical Scenario 3.

7. If the initial gross screening method (Step 1) does not indicate a radioactivity greater than the ADLs, gross " and \$ analyses using a 5-mL sample and a counting time of about 30 minutes should be performed to verify that these ADLs have not been exceeded. The (

isotopic analysis (original sample container or 5-mL aliquant) of Steps 2 and 7 using a HPGe detector and a counting time less than 60 minutes may have a detection limit needed to quantify radionuclides at concentrations corresponding to the 500- or 100-mrem ADLs. If not, the sample should be counted longer.

Tritium is a potential contaminant that will not be detected by either of the gross analysis screens unless LSC is used to determine gross beta. If GPC is used for gross beta analysis, a separate aliquant of the sample will need to be analyzed for tritium by LSC. Tritium analysis should be performed during this stage of the analytical process. The ADL for tritium at this stage in the analytical process is 7.5×10^{5} pCi/L.

8. Here the results from screening analyses performed in Step 7 are compared to the 500-mrem ADLs from Tables 5A and 5B (" 1.0×10^{3} or \$ 6.0×10^{3}), <u>or</u> specific (-emitting radionuclide ADL concentrations, respectively. If the screening concentrations are greater than these ADLs, a high priority would be established to analyze the samples for specific radionuclides in Steps 4, 5, or 6. If the screening results of Step 7 do not exceed the ADLs, then the question in Step 9 is evaluated.

9. Does the gross or specific radionuclide concentration exceed the corresponding (" 200 or \$ 1.2×10^{3})* <u>or</u> specific (-emitting (3.3×10^{3} for ^{60}Co) radionuclide 100-mrem ADL concentrations, respectively? If "yes," proceed immediately with subsequent analyses. The status of samples exceeding the 100-mrem ADLs should be communicated to the IC. If "no," go to Step 11.

> NOTE: "*" gross concentrations noted above correspond to the 100-mrem ADL values for ^{241}Am and ^{90}Sr, respectively, listed in Tables 5A and 5B. These are not the lowest concentrations for all radionuclides, and decisions about the presence of other radionuclides should not be made until radionuclide-specific analyses have been performed.

10. Use a routine method that can provide analytical results within about one day. Sample size and counting time will need to be increased to verify screening levels and to quantify those radionuclides whose individual concentrations are below their corresponding 100-mrem ADL values listed in Tables 5A and 5B on pages 32 and 33 (see notes for Steps 4, 5, and 6 for other information on specific radionuclide analyses).

Calculate the sum of the ratios (individual nuclide concentration/100-mrem AAL are in Tables 10A and 10B, page 59) of all radionuclide concentrations above their respective RDL values (Tables 7A and 7B, page 36). If the summed value exceeds unity, then the 100-mrem AAL has been exceeded even though an individual value <u>does not</u> exceed the ADL (see example calculation in footnote 2 on page 41).

If the IC does not specify the sequence of analyses, laboratory personnel should use their best professional judgment, based on the radiological characteristics of the samples and in order of highest to lowest concentration, to determine the order to process the samples to produce expeditious results.

11. A \$/(ratio >2.5 (i.e., ratio of gross \$ to gross () indicates that ^{90}Sr or ^{89}Sr may be a significant contaminant. Although this decision falls into the low-priority path, this analysis should be done first for the low-priority samples because of the dose significance of ^{90}Sr and the time required to do this analysis. Note that for the higher priority flow path, determination of strontium would be done in parallel with other analyses, so the urgency of its analysis does not need to be emphasized. Sufficient activity of the sample is necessary to have a statistically significant $/(ratio. The summed individual (activities obtained from the HPGe detector from the printout would need to be applied for this calculation.

12. A GPC gross " and $ analysis of a larger sample (250 mL) and a longer counting time is warranted. These analyses will determine if either of the MCL values for drinking water (15 " pCi/L or 50 $ pCi/L) has been exceeded. Range determination of $-particle energy (see footnote on page 16) may be very effective with this 250-mL sample residue. This would help to further refine which $-only emitter is present at the highest concentration and deserves the priority analysis.

13. Determine if any gross ", $, or (sample concentration exceeds the concentration corresponding to the screening MCL. For alpha emitters, this is 15 pCi/L and for beta emitters, this is 50 pCi/L. The status of any samples exceeding Safe Drinking Water Act standards should be communicated to the field coordinator.

14. Routine low-level analyses including total radiostrontium should be performed if not already done. If total radiostrontium results are greater than the ADL, use classical techniques to identify activities of ^{89}Sr and ^{90}Sr separately. A longer count time (isotopic analysis should be completed first. This will assist in the identification of " or $ emitters, which may have low abundance gamma rays. Additionally, if the (emitters are parent isotopes for other radionuclides, this will direct the analyst on which other analyses should be performed first. Sample size, counting time, and turnaround times shall be adjusted based on the laboratory's SOPs for water-compliance monitoring (see notes for Steps 4, 5, and 6 for other information on specific radionuclide analyses).

If the gross " concentration is between 5 and 15 pCi/L, "-specific radionuclide analysis is required to identify the radionuclides, including ^{226}Ra. If the gross " concentration is less than 5 pCi/L, the sample should be analyzed for ^{228}Ra and ^{226}Ra, and by gamma spectrometry to verify that there are no low-activity (emitters present.

15. When the high and intermediate priority radionuclide-specific analyses are completed, verify that no major nuclide has been missed: the sum of the individual nuclide concentrations (excluding tritium if screening measurement was made by GPC) is approximately equivalent to the gross activity concentration (a rule of thumb is within a range of about half to twice the gross value). This check will ensure that the sum of the measurements compares reasonably to the total measured gross activity. Activity concentrations due to decay products should be included in the verification. If not yet verified, the sum of the ratios (individual $- and (-emitter radionuclide concentration/100-mrem AAL are in Table 10B) of all radionuclide concentrations above their corresponding RDL value (Table 7B) must be calculated. If the summed value exceeds unity, then the 500-mrem or 100-mrem AAL has been exceeded, even though an individual radionuclide activity value <u>does not</u> exceed the respective ADL (see example calculation in Appendix II, Scenario I, Step 15).

16. All samples should be archived for long-term or follow-up analyses. Those samples having radionuclide concentrations exceeding concentrations for the 100-mrem ADLs should be checked for preservation and stored for potential future analysis.

The IC should be notified with specific results for samples and radionuclide concentrations.

17. Archive samples for drinking water analyses. See Tables 7A and 7B for drinking water MCLs and their required detection limits (RDLs).

Additional Points:

Analysts should recognize that when performing gross " or gross \$ analysis by evaporation of a sample, a significant loss of volatile radionuclides (such as tritium and iodine) will occur. Following this initial screening technique, the absence of any volatile radionuclides may need to be verified, depending upon the nature of the event.

Certain "- and \$-emitting radionuclides have (rays that are not used normally for analysis of those radionuclides, and may not necessarily be identified in gamma spectrometry software. The combination of gamma-ray abundance and half-life makes the gamma ray of little utility unless there is a significant mass of the material or the sample is counted for a long time. It is recommended that a separate library for incident response samples be created that has these (rays. Table 3 provides some examples.

TABLE 3 – Radionuclides with Low-Abundance Gamma Rays Not Usually Used For Their Analysis

Radionuclide	**^{89}Sr**	**^{90}Y**	**^{129}I**	**^{210}Po**	**^{226}Ra**		**^{228}Th**
Principal Decay	\$$^{-}$	\$$^{-}$	\$$^{-}$	"	"		"
Gamma, keV	909	1761	40 (32 X-ray)*	80.3	186 (262)*		84
Abundance, %	9.5×10^{-4}	1.1×10^{-2}	7.5 (92.5)*	1.1×10^{-3}	3.3 (5×10^{-3})*		1.21
Radionuclide	**^{232}Th**	**^{235}U**	**^{237}Np**	**^{238}Pu**	**^{239}Pu**	**^{240}Pu**	**^{241}Am**
Principal Decay	"	"	"	"	"	"	"
Gamma, keV	911 (from ^{228}Ac)	185.7	86.5	55.3	112.9	54.3	59.5
Abundance, %	27.2	54	12.6	4.7×10^{-2}	4.8×10^{-2}	5.2×10^{-2}	35.7
Radionuclide	**^{241}Pu**	**^{242}Pu**	**^{243}Cm**				
Principal Decay	\$$^{-}$	"	"				
Gamma, KeV	149	44.9	278				
Abundance, %	1.9×10^{-4}	4.2×10^{-2}	14				

* Values in parentheses represent the next most abundant gamma ray.

These gamma rays can be used for qualitative identification of these radionuclides. Their presence in the gamma-ray spectrum should direct the analyst to perform chemical separations followed by alpha- or beta-specific detection.

Aluminum absorbers can be used to qualitatively identify the presence of radionuclides based on penetrating ability. Thus, if an aluminum absorber of 6.5 mg/cm^2 is used, and the measured activity is reduced to background, one could qualitatively state that the beta particle energy of the radionuclide is < 0.067 MeV. Conversely, if the absorber has little effect on the count rate, it can be stated that the beta particle energy is >0.067 MeV. Table 4 identifies some beta-only emitters with their energies and range in aluminum absorbers.

TABLE 4 – Beta "Only" Emitters

Radionuclide	**^{241}Pu**	**^{63}Ni**	**^{129}I**	**^{35}S**	**^{99}Tc**	**^{32}P**	**^{90}Sr/^{90}Y**
Maximum Beta Energy, MeV	0.021	0.067	0.150	0.167	0.294	1.711	(0.546)/2.28 [1]
Range [2] in Aluminum, mg/cm^2 for $E_{\$max}$	0.8	6.5	27	32	75	800	1,100

Notes:

[1] It may be assumed that ^{90}Sr/^{90}Y will be in secular equilibrium by the time any analysis is started. Thus, the 2.28 MeV beta particle of ^{90}Y will be present.

[2] U.S. Department of Health, Education and Welfare (HEW). 1970. *Radiological Health Handbook*, p.123.

VI. RADIOANALYTICAL SCENARIO 2 (Identifying Uncontaminated Drinking Water)

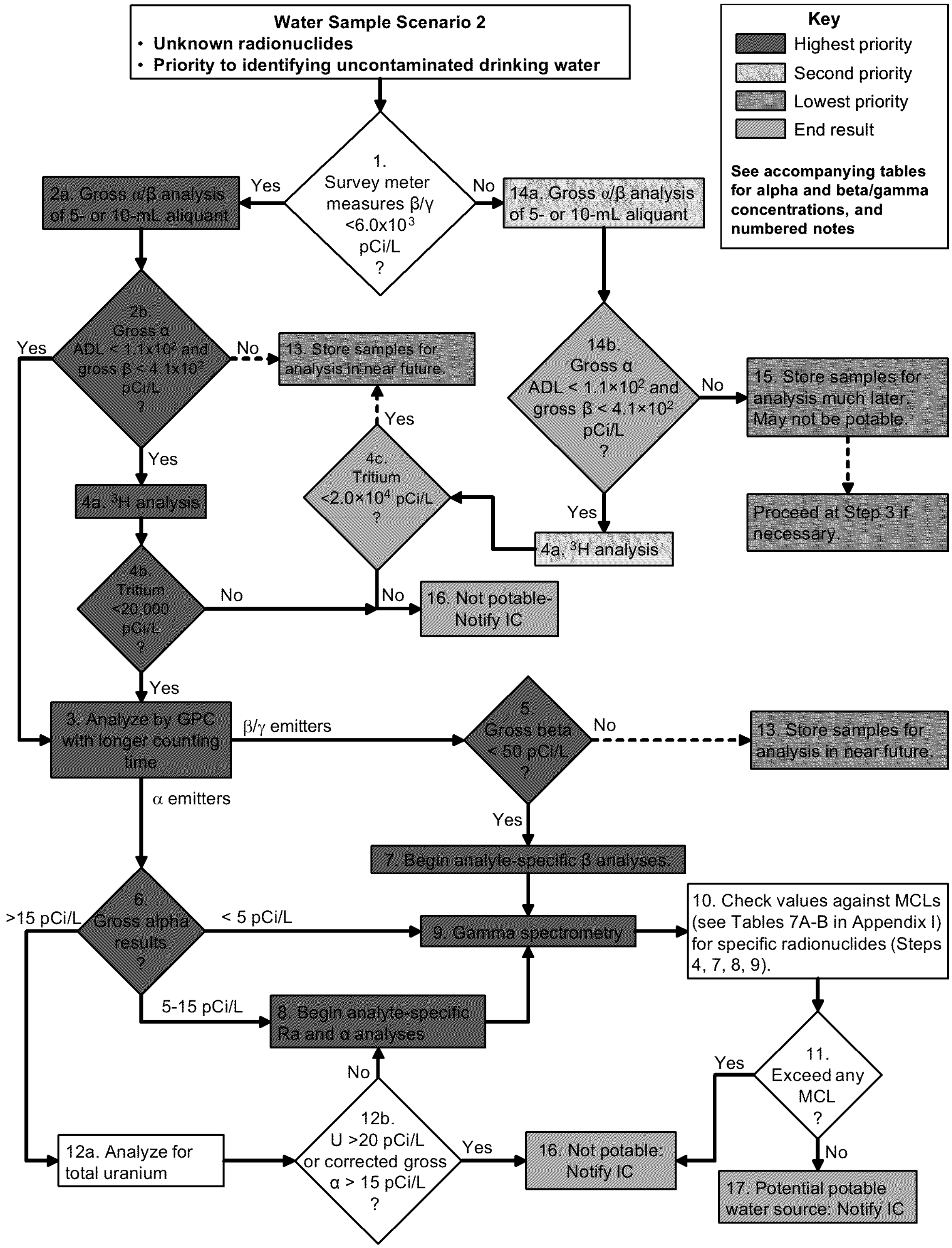

Figure 3 – Water Scenario 2 Analytical Flow

ED_001057_00006480

Notes for Scenario 2: Contaminating Radionuclides Unknown
Purpose: Rapid Identification of a Potable Water Source

Highest priority samples are all analyzed first. Only after an analytical step or procedure has been completed for the highest priority samples should lower priority samples be addressed. he samples may arrive over several days; analysis for those with the highest priority are always started first. Lower priority samples (those following the green and yellow flow paths on this chart) may need to be stored for several days until the highest priority samples have been analyzed. The samples with the highest priority in this instance will be the ones with the lowest activity. Gross " and $, and all analyses done to assess MCL values, must use standard methods approved for drinking water (page 9). This scenario assumes that the sources being analyzed have already been used as potable water sources.

Many of the flow diagram shapes are color-coded to reflect the highest priority analytical flow path (green), intermediate (next important) flow path (yellow), or the lowest priority flow path (olive brown) based on the time needed to return the required analytical results to the IC. The accompanying numbered notes are color-coded in the same fashion, as are the examples in Appendix III. It is highly advisable to study the flow paths in color, as a black-and-white printing may be confusing or ambiguous.

1. Screening with a hand-held survey instrument is to be performed as a contact reading on the outside of the sample container. The purpose of this screen is to eliminate quickly those samples that are obviously contaminated and thus may not be used as a drinking water source. Appropriate instruments might include a survey meter or Geiger-Muller counter with calibrated beta and gamma detector probes or a micro-roentgen meter (gamma only),[1] using a ^{137}Cs source geometry that would replicate the sample container geometry. The calibration measurement should be capable of identifying a concentration down to 6.0×10^3 pCi/L, which is half of the 100-mrem AAL for ^{137}Cs. Laboratories will need to develop instrument-specific calibration SOPs, which include the use of a mock sample container with a radionuclide source.

> NOTE: The next steps use screening techniques. The MDCs are used as AALs. These values are based on those routinely achievable using the count times and volumes noted in Table 12 of Appendix VI.

2a. Gross alpha and gross beta screening measurements may be performed using a liquid scintillation counter (LSC)[2] or a gas proportional counter (GPC). For LSC, a 5- to 10-mL sample is mixed with a liquid scintillation cocktail in a LSC vial and counted for approximately 10 minutes. For GPC, a 5- to 10-mL sample is deposited on a planchet,

[1] Some manufacturers have developed kits that include the survey meter plus an alpha–beta–gamma pancake GM detector and a NaI gamma detector.

[2] LSC screening of samples typically is preferred over GPC because sample preparation of a 5-mL aliquant is much simpler, less time-consuming, and avoids possible contamination.

evaporated, and then counted for approximately 30 minutes. Note that, dependent upon the type of instrument used, the count time for some analyses may be shorter with LSC than with GPC. The total mass of evaporated residue for GPC analysis may prevent processing a full 500 mL aliquant. In these cases, a smaller volume and longer count time will be required.

The ADLs for this part of the analysis are based on the AAL being considered MDC values. The ADL values are 110 pCi/L gross " and 410 pCi/L gross $ concentration (see Table 11A in Appendix VI). Table 12 in Appendix VI shows that the MDC values (210 pCi/L and 820 pCi/L) can be achieved with a 10-minute count of a 5-mL sample. Volumes and count times may be adjusted based on laboratory-specific instrumentation.

Screening for radionuclides such as $^{125/129/131}$I will not be able to be performed by GPC unless the samples are carefully prepared to prevent loss of radioiodines due to volatilization. Furthermore, radionuclides that decay by electron capture (such as ^{57}Co, ^{75}Se, ^{103}Pd) may not be able to be screened using GPC. If any of these electron-capture radionuclides are present, analysis using a low-energy photon detector (LEPD) or a specific separation scheme for each will be required.

Tritium cannot be screened using GPC techniques, because it will most likely be present as a tritiated water molecule. LSC should be used routinely for tritium analysis because of tritium's very low electron energy and its likely presence as part of a water molecule. For these reasons, tritium has a special status. If GPC analysis, and both alpha and beta analyses are less than the ADLs, Steps 4a and 4b must be performed. If LSC analysis is used and both alpha and beta analyses are less than the ADLs, proceed directly with Step 3.

2b. A concentration less than the ADL for this part of the analysis—110 pCi/L gross " and 410 pCi/L gross $—will identify the samples most likely to have radionuclide concentrations that are below the Maximum Contaminant Levels (MCLs) for natural radionuclides, as well as anthropogenic radionuclides.

In subsequent steps, it will be necessary to show that gross " < 15 pCi/L and gross $ < 50 pCi/L (40 CFR Parts 9, 141, and 142, *National Primary Drinking Water Regulations; Radionuclides*; Final Rule. *Federal Register* 65:76707-76753, December 7, 2000).

If the results of either the gross alpha or beta analysis are greater than the ADLs for this step (which are based on the MDCs in Table 12), the sample should be checked for preservation and stored for analysis at a later time, to assess the presence of other radionuclides.

3. The gross alpha and beta results should be compared to specific limits from the Safe Drinking Water Act (Steps 5 and 6). The analyses for gross alpha and beta at these levels will require a larger sample volume and longer counting times. Gross " and $ analysis by GPC is a requirement of the SDWA.

> NOTE: Steps 3 and 4a (4a only required when GPC analysis is done) should be done in parallel to expedite the decision for further analyses.

4a. Samples for tritium analysis may need to be either distilled or passed through an ion exchange resin if the gross beta results indicate significant counts above background (this could be due to naturally occurring radionuclides and still be less than MCLs). If tritium is present above the MCL of 20,000 pCi/L, the water source is not suitable for long-term use as drinking water.

4b. If the high priority sample tritium result is <20,000 pCi/L, a fresh sample aliquant (~ 4 L, portions of which will be used for separate analyses) should be analyzed for gamma, beta, and alpha emitting radionuclides (Steps 7, 8, and 9). If tritium concentration is > 20,000 pCi/L, the water is not a suitable drinking water source (Step 16).

4c. If tritium concentration of the low priority sample is >20,000 pCi/L, the water supply is not suitable as a drinking water source (Step 16). If tritium concentration is < 20,000 pCi/L, preserve the sample for future analyses (Step 13).

5. Analysis for specific beta emitters (Step 7) will be performed if the gross beta activity is less than 50 pCi/L. Methods used for specific beta emitters should be able to distinguish among the various isotopes of a specific element. Gross beta activity greater than 50 pCi/L means the source may not be suitable as a long-term drinking water supply. The sample should be checked for preservation and stored for analysis at a later date (Step 13).

6. Gross alpha analysis will need to distinguish among three different levels. Gross alpha activity between 15 and 35 pCi/L shall be analyzed for uranium contributions (Step 12). The uranium result is subtracted from the gross alpha result to determine gross alpha exclusive of uranium.

If gross alpha is between 5 and 15 pCi/L, alpha-specific radionuclide analysis is required to identify the radionuclides, with ^{228}Ra and ^{226}Ra taking priority. After or at the same time as these analyses, gamma spectrometry should be performed to assess presence of any gamma emitters.

Finally, if the gross alpha is less than 5 pCi/L, the sample should be analyzed for ^{228}Ra and ^{226}Ra, and by gamma spectrometry to verify that there are no low-activity gamma emitters present. The project manager may request additional radionuclide-specific analysis for man-made alpha emitters.

7. Chemical separation to be performed for pure $-emitting radionuclides not identifiable using gamma spectrometry include—but are not limited to— ^{3}H (Step 4), ^{90}Sr, ^{89}Sr, ^{99}Tc, ^{241}Pu, and ^{32}P. Sr-90 and ^{89}Sr would have the highest priority if project management guidance is not provided. This step is done in parallel with Step 9.

8. Gross alpha activity between the detection limit and 15 pCi/L may indicate presence of anthropogenic alpha emitters or naturally occurring radium radionuclides. The exact nature of the activity should be verified, because these samples are the result of contamination. Samples should be analyzed for ^{228}Ra and ^{226}Ra.

9. Samples for gamma spectrometry analysis should be counted long enough to meet the ^{134}Cs RDL of 10 pCi/L. The count time is dependent on the sample size, background, and detector efficiency (this will be a laboratory-specific counting time; 1-3 hours is an approximate value). The software library should include lines for the predominant gammas of all products in the U and Th natural decay series as well as any anthropogenic radionuclide with a half-life of greater than 1 day. The purpose of including these naturally occurring gamma-ray peaks in the library is to ensure complete identification of all gamma rays. Due to differential solubilities of the progeny of U, Th, and Ra, no assumptions or predictions can be made regarding the presence of the parents unless specific radiochemical separations are performed. Gamma analyses should be performed in parallel with the alpha- and beta-specific analyses. This step is done in parallel with Step 7.

10. Here the results from analyses performed in Steps 4a, 7, 8, and 9 are compared to their respective MCLs (Tables 7A and 7B, Appendix I).

11. If any radionuclide exceeds its MCL, the source should not be considered potable (Step 16). For beta emitters, the sum of the ratios (individual nuclide concentration/MCL value) of all concentrations greater than the RDL values must be calculated. If the sum of the fractions of all $ and (-emitting radionuclides present exceeds 1.0, the water source is not potable.

12a. If gross alpha analysis in Step 6 is greater than 15 pCi/L, then perform analysis for total uranium (i.e, total uranium present on a mass basis).

12b. If the total uranium concentration is less than 20 pCi/L (30 :g/L or 30 ppb), and the corrected gross alpha activity (Gross alpha - total uranium) > 15 pCi/L, go to Step 8 and begin ^{226}Ra and ^{228}Ra analyses and any other alpha analyses requested by the IC. If the total uranium concentration is greater than 20 pCi/L, the water source cannot be used as a potable water supply (Step 16).

13. It is possible that the source may be acceptable for drinking water once radionuclide-specific analyses are performed. This path has a secondary priority. These samples should be checked to assess whether or not preservation, using acids or other appropriate chemical, has been performed. If not preserved, preservation appropriate to the analyte(s) should be made and the sample stored for potential analysis. Any decision to conduct further analyses or to dispose sample(s) should be made by the IC.

NOTE: The values in Step 14b correspond to the ADL values in Table 11A of Appendix VI.

14a. Samples that are greater than 6.0×10^3 pCi/L using the survey meter screening method may contain naturally occurring radionuclides but will not be potable. Analyze an aliquant of the sample by gross alpha and beta analysis.

14b. If the results of either the gross alpha or beta analysis[1] are greater than the ADLs, the sample should be preserved for analysis at a later time. It will not be acceptable as a drinking water source, but more detailed analysis may subsequently be required. If the gross alpha and gross beta analyses are both less than 110 pCi/L gross " and 410 pCi/L gross $, tritium analysis

[1] LSC screening of samples typically is preferred over GPC because sample preparation of a 5-mL aliquant is much simpler, less time-consuming, and avoids possible contamination.

should be performed later (Step 4a of the yellow path).

15. Those samples that exceed the ADLs established for Steps 2a and 2b should be checked for preservation and stored until all other water sources have been analyzed and found acceptable or not acceptable. Specific radionuclide analyses may determine that the water source is acceptable.

16. The water supply is not suitable as a drinking water source. At least one analysis or the sum of the fractions of the beta emitters has exceeded the MCL for drinking water for that radionuclide.

VII. RADIOANALYTICAL SCENARIO 3 (Contaminating Radionuclides are Known)

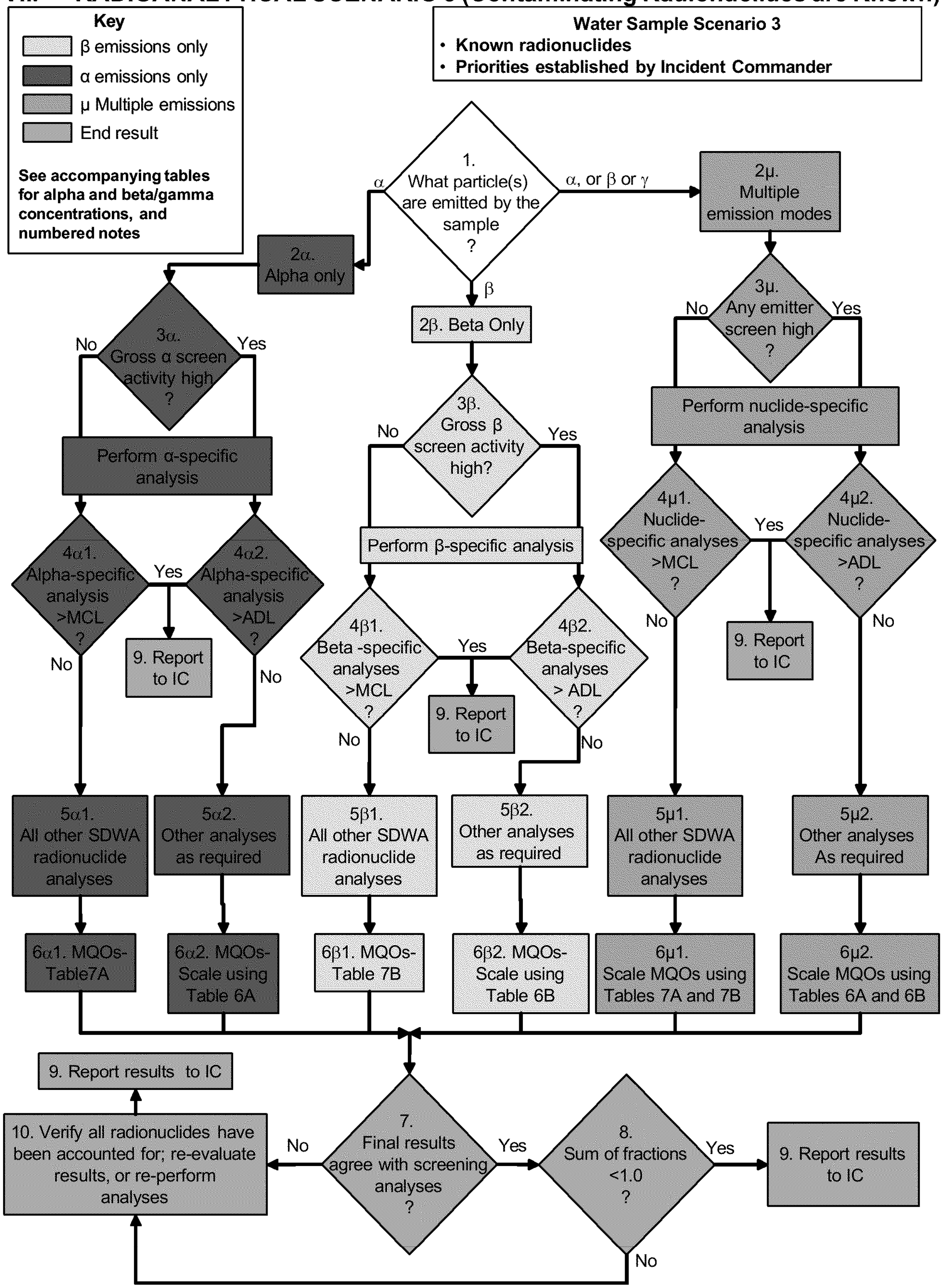

Figure 4 – Water Scenario 3 Analytical Flow

Notes for Scenario 3: **Contaminating Radionuclides Known**
Purpose: **Support the Specific Needs of the IC**

For this scenario, “"” and “$” designate paths to be followed (and their associated notes) when samples received from the field contain radionuclides that emit only alpha or beta particles, respectively, and “ : ” (indicating a mixture of "-, $-, or (-emitting radionuclides) designates samples that contain either a gamma emitter or multiple emitters (alpha plus beta).

Scenario 3 takes place when the radioactive contaminants have been well characterized. Detailed analyses are required for the radionuclide(s) known to be in the samples, and at the direction of the IC. Thus, the radioanalytical process chart becomes much more streamlined, and sample priority is based upon what is needed by the Incident Commander at the time the samples are taken. Either high- or low-activity samples may take priority.

Because the radionuclides are known, the gross screening instruments should be calibrated for the radionuclides of interest. This allows rapid and more accurate assessment of the activity before the analytical separations are performed.

Many of the flow diagram shapes are color-coded to reflect the analytical flow path for various combinations of decay modes (green for alpha, gray for beta, or brown for any two emitters). The accompanying numbered notes are color-coded in the same fashion, as are the examples in Appendix IV. It is highly advisable to study the flow paths in color, as a black-and-white printing may be confusing or ambiguous.

1. The event that has taken place is now characterized, and the radionuclide(s) of concern have been identified. The flowchart is trimmed to deciding which of the three different radionuclide emissions are present. The emission mode generally determines the final radioanalytical method(s) that will be used to assess the concentration. Generally, $-only emitters will be analyzed by GPC or LSC, "-only emitters by either GPC or AS, and $- and (-emitters by gamma spectrometry. The choice is determined by what is known about the event. If more than one type of radionuclide emitter is present, the choice is to follow the (", or $, or () path.

2". This path is selected only if all the radionuclides from the event are " emitters. The samples still should be screened to distinguish high from low-activity samples. The instrument used to perform the screening analysis should be calibrated with the radionuclide of interest.

2$. This path is selected only if all the radionuclides from the event are $ emitters. The samples still should be screened to distinguish high from low-activity samples. The instrument used to perform the screening analysis should be calibrated with the radionuclide of interest. If more than one radionuclide is present, the screening instrument should be calibrated with the radionuclide that is expected to produce the lowest response. This will provide screening results that are a more conservative estimate of the activity present for that radionuclide.

2:. This path is selected only if the radionuclides from the event emit a combination of ", or $, or (emitters. The samples still should be screened to distinguish high from low-activity samples. The instrument used to perform the screening analysis should be calibrated with the radionuclide of interest.

3". 3$. 3:. The purpose of this step is to distinguish high-activity samples from low-activity samples and to rank the samples in order of their activity level. The subsequent flow paths would be selected based on the priority from the IC. Thus, it is important that this screening method is able to distinguish high-activity samples from low-activity samples in a reasonably short time. Using a 1-hour count time as the maximum and a 10-mL aliquant as the minimum, Table 12 in Appendix VI demonstrates the capability for MDC and critical-level values that can be achieved routinely using LSC or GPC analytical methods. Although these MDCs are not equivalent and do not relate to a specific DWC, they are low enough to be used for screening purposes. The samples should be numerically ranked based on their gross concentration and processed according to the priority specified by the IC.

> NOTE: The flow of priority splits here. Either of the paths for the suffixes 1 or 2 may get the priority. The difference is that suffix 1 is for SDWA requirements, and that suffix 2 flow path would be for IC-determined MQOs. Flow path 2 would be scaled to the appropriate ADL based on the 100-mrem values.

$4"_1$ $4\$_1$ $4:_1$ The first analytical priority when this path is chosen is for the <u>known</u> contaminant(s) from the event. This should use a radionuclide-specific method, and the RDL should be less than or equal to that shown in Table 7A or 7B. This path would be chosen if the intent was to look for potable water sources. If the event-specific contaminant is less than its respective MCL in Table 7A or 7B, then analysis for all other SDWA contaminants should proceed. If the event-specific contaminant concentration is greater than its respective MCL in Table 7A or 7B, notify the IC that this is not a potential potable water source.

$4"_2$ $4\$_2$ $4:_2$ The first analytical priority when this path is chosen is for the <u>known</u> contaminant from the event. This should use a radionuclide-specific method, and the ADL concentration plus corresponding u_{MR} value should be a multiple of the value found in Table 6A or 6B (these tables are for the 100-mrem ADLs; the multiple would be based on the ratio of 100-mrem value to the maximum dose for the particular event). This path would be chosen if the direction were to identify water sources that may cause exposure in excess of the maximum dose allowed for the event. If the event-specific contaminant is less than its respective ADL (based on scaling of concentrations and in Tables 6A or 6B), then analysis for all other contaminants of concern should proceed. If the event-specific contaminant concentration is greater than its respective ADL for that event, notify the IC that this sample has exceeded the event-specific AAL.

$5"_1$ $5\$_1$ $5:_1$ Perform all other radionuclide SDWA required analyses.

$5"_2$ $5\$_2$ $5:_2$ Perform all other event related or requested radionuclide analyses.

$6"_1$ $6\$_1$ $6:_1$ Select the MCL values from Tables 7A or 7B to be compared with the final analytical concentrations for the water sample.

6"$_2$ 6$$_2$ 6:$_2$ Select the ADL values from Tables 6A or 6B (scaled to the AAL for the event) to be compared with the final analytical concentrations for the water sample.

7. Compare the final results with the screening analysis and verify that no major nuclide has been missed: the sum of the individual nuclide concentrations (excluding tritium if the screening measurement was made by GPC) is approximately equivalent to the gross activity concentration (a rule of thumb is within a range of about half to twice the gross value). This check will ensure that the sum of the measurements compares reasonably to the total measured gross activity. Activity concentrations due to decay products should be included in the verification. If there is a discrepancy between the summed activity concentration of all statistically significant individual nuclide concentrations (i.e., sum all results detected at levels greater than the RDL or for drinking water), check for errors and resolve any discrepancies prior to proceeding.

8. If the sum of the fractions of all $- and (-emitting radionuclides present exceeds 1.0, verify analyses or calculations. The sample would have concentrations that exceed the 40 CFR limits. If the individual results and the sum of the fractions are less than their respective limits, report results to IC.

9. Several actions lead to this step:

- In steps 4"$_1$, 4$$_1$, and 4:$_1$, the result for the event-specific radionuclide exceeded the MCL for the radionuclide in potable water.
- From Step 8, all analyses indicated that the sample is within the limits of the MCLs from the SDWA.
- In steps 4"$_2$, 4$$_2$, and 4:$_2$, the event-specific radionuclide exceeded the ADL for the event.
- From Step 10 if the sum of fractions is greater than 1.0.
- From Step 10 if gross activity and sum of individual radionuclide activities in sample do not match within 0.5 to 2.0.

Notify the IC of the specific final results for all samples, with a description of any unresolvable discrepancies. All sample residuals or final counting forms should be archived until notification to dispose of them is received.

10. The results from the radionuclide-specific analysis and the gross measurement should match to within a factor of 0.5 to 2.0. If they do not, re-analysis may be required starting with the gross-activity measurement. It is possible that either a short-lived radionuclide activity has decayed away prior to having been analyzed, or a radionuclide analysis was missed. In either case, the discrepancy should be resolved, which may include specific correlations for the radionuclides from this event.

If this step is arrived at as a result of the sum of fractions being greater than 1.0, verify the data to ensure correctness and that the gross activity and sum of individual activities are within a factor of 0.5 to 2.0. When this review is completed, notify the IC of results per Step 9.

Appendix I. Tables of Radioanalytical Parameters for Radionuclides of Concern

TABLE 5A – Analytical Decision Levels (ADL) and Required Method Uncertainty For Gross Alpha Screening Analysis

			pCi/L			
			500-mrem [2]		100 mrem [2]	
Radionuclide	**Half-Life [1]**	**Additional Emissions**	**ADL**	**Required Method Uncertainty [4, 5] (u_{MR})**	**ADL**	**Required Method Uncertainty [4, 5] (u_{MR})**
Gross " Screen	—		1.0×10^3	6.1×10^2	200	120
Am-241[3]	432.2 y	(	1.0×10^3	6.1×10^2	200	120
Cm-242	162.8 d		7.0×10^3	4.3×10^3	1.4×10^3	8.5×10^2
Cm-243	29.1 y	(	1.3×10^3	760	250	150
Cm-244	18.10 y		1.5×10^3	8.8×10^2	290	1.8×10^2
Np-237	2.144×10^6 y	(	2.0×10^3	1.2×10^3	390	2.4×10^2
Po-210	138.4 d		65	40	13	7.9
Pu-238	87.7 y		900	550	180	110
Pu-239	2.411×10^4 y		850	520	170	100
Pu-240	6.564×10^3 y		850	520	170	100
Ra-226	1.600×10^3 y	(DP	460	280	90	55
Th-228	1.912 y	(DP	1.3×10^3	790	260	160
Th-230	7.538×10^4 y		900	550	180	110
Th-232	1.41×10^{10} y	(DP	800	490	160	97
U-234	2.455×10^5 y	(DP	3.2×10^3	1.9×10^3	650	400
U-235	7.038×10^8 y	(DP	3.3×10^3	2.0×10^3	650	400
U-238	4.468×10^9 y	(DP	3.5×10^3	2.1×10^3	700	430

Notes:

[1] The half-lives of the nuclides are given in years (y) or days (d). DP refers to "decay products." Radionuclide above the gray bar is default for calibrating screening instrumentation.

[2] The values in this table correspond to the numbered rectangles 2 and 7 in Radioanalytical Scenario 1.

[3] The u_{MR} and ADL for ^{241}Am are used for gross alpha screening.

[4] The relative required method uncertainty (n_{MR}) for values greater than the AALs in Table 10A of Appendix VI can be obtained by dividing the u_{MR} value in this table by the corresponding AAL value in Table 10A.

[5] The individual required method uncertainty (u_{MR})values in this table apply up to the corresponding values for AALs or 100-mrem values, respectively, identified in the tables in Appendix VI. Above the values noted in the Appendix VI tables, the relative required method uncertainty (n_{MR})would apply.

TABLE 5B – Analytical Decision Levels (ADL) For Gross Beta or Gamma Screening Analysis

Radionuclide	Emission Type	Half-Life [1]	pCi/L 500 mrem ADL	pCi/L 500 mrem Required Method Uncertainty [3, 6] (u_{MR})	pCi/L 100 mrem ADL	pCi/L 100 mrem Required Method Uncertainty [3, 6] (u_{MR})
Beta Gamma Screen[2]	$ (	30.07 y	2.9×10^{4}	1.8×10^{4}	6.0×10^{3}	3.6×10^{3}
Sr-90[2]	$ ($ DP)	28.79 y	6.0×10^{3}	3.6×10^{3}	1.2×10^{3}	730
Co-60[2]	$ (	5.270 y	1.7×10^{4}	1.0×10^{4}	3.3×10^{3}	2.0×10^{3}
Ac-227+DP	$ (" DP)	21.77 y	550	330	110	67
Ce-141	$ (	32.51 d	1.1×10^{5}	6.7×10^{4}	2.2×10^{4}	1.3×10^{4}
Ce-144	$ (	284.9 d	1.5×10^{4}	8.8×10^{3}	2.9×10^{3}	1.8×10^{3}
Co-57	(	271.1 d	3.2×10^{5}	1.9×10^{5}	6.5×10^{4}	4.0×10^{4}
Cs-134	$ (	2.065 y	2.2×10^{4}	1.3×10^{4}	4.3×10^{3}	2.6×10^{3}
Cs-137	$ (	30.07 y	2.9×10^{4}	1.8×10^{4}	6.0×10^{3}	3.6×10^{3}
H-3	weak $	12.32 y	3.9×10^{6}	2.3×10^{6}	7.5×10^{5}	4.6×10^{5}
I-125	(	59.40 d	6.5×10^{3}	4.0×10^{3}	1.3×10^{3}	790
I-129	$ (	1.57×10^{7} y	1.7×10^{3}	1.0×10^{3}	330	200
I-131	$ (	8.021 d	2.7×10^{3}	1.6×10^{3}	550	330
Ir-192	$ (	73.83 d	6.0×10^{4}	3.6×10^{4}	1.2×10^{4}	7.3×10^{3}
Mo-99	$ (((DP)	65.94 h	1.6×10^{5}	9.7×10^{4}	3.2×10^{4}	1.9×10^{4}
P-32	$	14.26 d	3.0×10^{4}	1.8×10^{4}	6.0×10^{3}	3.6×10^{3}
Pd-103	(	16.99 d	3.9×10^{5}	2.4×10^{5}	8.0×10^{4}	4.9×10^{4}
Pu-241	$	14.29 y	5.0×10^{4}	3.0×10^{4}	1.0×10^{4}	6.1×10^{3}
Ra-228	$ ((DP)	5.75 y	80	49	16	9.7
Ru-103	$ (	39.26 d	1.2×10^{5}	7.0×10^{4}	2.3×10^{4}	1.4×10^{4}
Ru-106	$ (	373.6 d	1.1×10^{4}	6.7×10^{3}	2.2×10^{3}	1.3×10^{3}
Se-75	(	119.8 d	3.4×10^{4}	2.0×10^{4}	6.5×10^{3}	4.0×10^{3}
Sr-89	$	50.53 d	3.2×10^{4}	1.9×10^{4}	6.5×10^{3}	4.0×10^{3}
Tc-99	$ (	2.11×10^{5} y	1.2×10^{5}	7.3×10^{4}	2.4×10^{4}	1.5×10^{4}

Notes:

[1] The half-lives of the nuclides are given in years (y), days (d), or hours (h). DP refers to "decay products." Radionuclides above the gray bar are the default radionuclides for calibrating screening instrumentation.

[2] The AAL and associated u_{MR} and ADL values for ^{137}Cs are used for initial beta gamma screening analysis on sample bottle (Step 1 in Radioanalytical Scenarios 1 and 2). The AAL and associated u_{MR} and ADL values for ^{60}Co concentration are used for gross gamma measurements thereafter (see text). The AAL and associated u_{MR} and ADL values for ^{90}Sr are the defaults used gross beta screening.

[3] The relative required method uncertainty (n_{MR}) for values greater than the AAL values in Table 10B of Appendix VI can be obtained by dividing the u_{MR} value in this table by the corresponding AAL value in Table 10B.

[4] Several nuclides in Table 5B decay by electron capture. These radionuclides cannot be detected using gross $ analysis. The electron-capture decay leads to characteristic X-rays of the progeny nuclide. The most effective way to detect the X-rays from these electron-capture-decay radionuclides is either with a low-energy photon detector (LEPD) or a reverse electrode germanium detector (N-type semiconductor detector). The lower energy range of these detectors is about 10 keV.

[5] If (isotopic analysis versus gross (analysis is used for rectangles 2 and 7 in Radioanalytical Scenario 1, comparisons should be made to the value specific for the radionuclide found in the (analysis listed in this table.

[6] The individual required method uncertainty (u_{MR}) values in this table apply up to the corresponding values for AALs or 100-mrem AALs identified in the tables in Appendix VI. Above the values noted in the Appendix VI tables, the relative required method uncertainty (n_{MR}) applies.

TABLE 6A – Required Method Uncertainties for Alpha-Emitting Radionuclides at 100-mrem AAL When Using Radionuclide-Specific Methods

Radionuclide	pCi/L	
	100-mrem ADL [1]	Required Method Uncertainty at or Below 100-mrem AAL [2, 3, 4] u_{MR}
Am-241	280	50
Cm-242	2.0×10^3	350
Cm-243	350	63
Cm-244	410	73
Np-237	550	98
Po-210	18	3.3
Pu-238	250	45
Pu-239	240	43
Pu-240	240	43
Ra-226	130	23
Th-228	370	65
Th-230	250	45
Th-232	230	40
U-234	920	160
U-235	920	160
U-238	990	180

Notes:

[1] Only the 100-mrem ADL and the associated required method uncertainty (u_{MR}) are shown.

[2] See Appendix VI for the rationale and methodology used in determining these values.

[3] These method uncertainties are applicable to each radionuclide when a radionuclide-specific method is used to determine the activity result .

[4] The values corresponding to an AAL of 100 mrem were chosen for these tables. These values can be used to conveniently scale to other project-specific AALs. For example, if a specific project had AALs at 20 mrem (one-fifth of 100 mrem), the table values can be scaled down simply by dividing the listed values by five. Thus, for an analytical action level of 20 mrem, the respective values for ^{210}Po would be one fifth the values listed in Table 10A and this table:

20-mrem AAL = [100-mrem AAL / 5] = [26/5] . 5.2 pCi/L,

20-mrem u_{MR} = [100-mrem u_{MR} / 5] = [3.3/5] . 0.66 pCi/L

and the corresponding 20-mrem ADL would be:

20-mrem ADL = [100-mrem ADL/5] = [18/5] = 3.6

See Appendix VI for details of these calculations.

TABLE 6B – Required Method Uncertainties for Beta- or Gamma-Emitting Radionuclides at 100-mrem AAL When Using Radionuclide-Specific Methods

Radionuclide	pCi/L 100-mrem ADL [1]	pCi/L Required Method Uncertainty at or Below 100-mrem AAL [2, 3, 4] u_{MR}
Ac-227+DP	160	28
Ce-141	3.1×10^4	5.5×10^3
Ce-144	4.1×10^3	730
Co-57	9.2×10^4	1.6×10^4
Co-60	4.7×10^3	830
Cs-134	6.1×10^3	1.1×10^3
Cs-137	8.5×10^3	1.5×10^3
H-3	1.1×10^6	1.9×10^5
I-125	1.8×10^3	330
I-129	470	83
I-131	780	140
Ir-192	1.7×10^4	3.0×10^3
Mo-99	4.5×10^4	8.1×10^3
P-32	8.5×10^3	1.5×10^3
Pd-103	1.1×10^5	2.0×10^4
Pu-241	1.4×10^4	2.5×10^3
Ra-228	23	4.0
Ru-103	3.3×10^4	5.8×10^3
Ru-106	3.1×10^3	550
Se-75	9.2×10^3	1.6×10^3
Sr-89	9.2×10^3	1.6×10^3
Sr-90	1.7×10^3	300
Tc-99	3.4×10^4	6.0×10^3

Notes:

[1] Only the ADL of 100 mrem and the associated required method uncertainty (u_{MR}) are shown.

[2] See Appendix VI for the rationale and methodology used in determining these values.

[3] These method uncertainties are applicable to each radionuclide when a radionuclide specific method is used to determine the activity result.

[4] The values corresponding to an AAL of 100 mrem were chosen for these tables and can be used to conveniently scale to other project-specific AALs. For example, if a specific project had AALs at 20 mrem (one-fifth of 100 mrem), the table values can be scaled down simply by dividing the listed values by five. Thus, for an AAL of 20 mrem, the value for ^{90}Sr would be one-fifth the values listed in Table 10B and this table:

$$20 \text{ mrem AAL} = 100 \text{ mrem AAL} / 5 = [2400/5] = 480 \text{ pCi/L}$$

$$20 \text{ mrem } u_{MR} = 100 \text{ mrem } u_{MR} / 5 = [300/5] = 60 \text{ pCi/L}$$

and its corresponding ADL would be:

$$20 \text{ mrem ADL} = 100 \text{ mrem ADL} / 5 = [1700 / 5] = 340 \text{ pCi/L}$$

See Appendix VI for details of these calculations.

TABLE 7A – Maximum Contaminant Levels (MCL) and Required Detection Levels (RDL) for Alpha-Emitting Radionuclides in Water

Radionuclide	Drinking Water MCL [1] pCi/L (mg/L) [2]	Drinking Water RDL[5] pCi/L (mg/L) [2]
Gross " Screen	15	3[4]
Am-241	15 (4.4×10^{-9})	1.5 (4.4×10^{-10})
Cm-242	15 (4.5×10^{-12})	1.5 (4.5×10^{-13})
Cm-243	15 (3.0×10^{-10})	1.5 (3.0×10^{-11})
Cm-244	15 (1.8×10^{-10})	1.5 (1.8×10^{-11})
Np-237	15 (2.2×10^{-5})	1.5 (2.2×10^{-6})
Po-210	15 (3.3×10^{-12})	1.5 (3.3×10^{-13})
Pu-238	15 (8.9×10^{-10})	1.5 (8.9×10^{-11})
Pu-239	15 (2.4×10^{-7})	1.5 (2.4×10^{-8})
Pu-240	15 (6.6×10^{-8})	1.5 (6.6×10^{-9})
Ra-226 [3]	5 (5.1×10^{-10})	1.0 (1.3×10^{-10})
Th-228 [3]	15 (1.8×10^{-11}	1.5 (1.8×10^{-12})
Th-230	15 (7.3×10^{-7})	1.5 (7.3×10^{-8})
Th-232	15 (1.4×10^{-1})	1.5 (1.4×10^{-2})
U-234	—	—
U-235	—	—
U-238	20 (3.0×10^{-2})	2.0 (3.0×10^{-3})
U-Nat	20 (3.0×10–2)	2.0 (3.0×10–3)

Notes:
[1] Continuous intake.
[2] Value in parenthesis is mass concentration units, (ppm).
[3] Combined concentration of ^{228}Ra and ^{226}Ra not to exceed 5 pCi/L.
[4] Value for RDL taken from 40 CFR 141.26(a)(2)(iii). See "Final Implementation Guidance for Radionuclides," EPA 816-F-00-002, March 2002. Available at: www.epa.gov/safewater/radionuclides/compliancehelp.html.
[5] RDL value taken as 1/10 of the MCL value if not otherwise specified in the regulations.

TABLE 7B – Maximum Contaminant Levels (MCL) and Required Detection Levels (RDL) for Beta/Gamma-Ray Emitting Radionuclides in Drinking Water

Radionuclide	Drinking Water MCL [1] pCi/L (mg/L) [2]	Drinking Water RDL [6] pCi/L (mg/L) [2]
Gross $ Screen	50	5.0
Ac-227+DP [4]	15	1.5
Ce-141	300 (1.1×10^{-11})	30 (1.1×10^{-12})
Ce-144	29, 30[4] (9.4×10^{-12})	2.9, 3.0 (9.4×10^{-13})
Co-57	1,000 (1.2×10^{-10})	100 (1.2×10^{-11})
Co-60	100 (8.8×10^{-11})	10 (8.8×10^{-12})
Cs-134	80 (6.2×10^{-11})	10 (7.8×10^{-12})
Cs-137	200 (2.3×10^{-9})	20 (2.3×10^{-10})
H-3	2.0×10^{4} (N/A)	1,000 (N/A) [7]
I-125	30 (1.7×10^{-12})	3.0 (1.7×10^{-13})
I-129	1 (5.7×10^{-6})	0.1 (5.7×10^{-7})
I-131	3 (2.4×10^{-14})	1.0 (8.0×10^{-15}) [7]
Ir-192	100 (1.1×10^{-11})	10 (1.1×10^{-12})
Mo-99	600 (1.2×10^{-12})[5]	60 (1.2×10^{-13})
P-32	30 (1.0×10^{-13})[5]	3.0 (1.0×10^{-14})
Pd-103	900 (1.2×10^{-11})[5]	90 (1.2×10^{-12})
Pu-241	300 (2.9×10^{-9})[5]	30 (2.9×10^{-10})
Ra-228 [3]	5 (1.8×10^{-11})	1.0 (3.7×10^{-12})[7]
Ru-103	200 (6.2×10^{-12})	20 (6.2×10^{-13})
Ru-106	30 (9.1×10^{-12})	3.0 (9.1×10^{-13})
Se-75	900 (6.2×10^{-11})	90 (6.2×10^{-12})
Sr-89	20 (6.9×10^{-13})	10 (3.4×10^{-13}) [7]
Sr-90	8 (5.8×10^{-11})	2.0 (1.4×10^{-11}) [7]
Tc-99	900 (5.3×10^{-5})	90 (5.3×10^{-6})

Notes:

[1] Continuous intake.

[2] Value in parenthesis is mass concentration units (ppm).

[3] Combined concentration of ^{228}Ra and ^{226}Ra not to exceed 5 pCi/L.

[4] Includes decay products originating from the ^{227}Ac in the body. Used only to calculate the concentration (pCi/L) or dose from ^{227}Ac in the body. DP refers to "decay products."

[5] Value from OSWER Directive 9283.1-14, Appendix B: "Use of Uranium Drinking Water Standards under 40 CFR 141 and 40 CFR 192 as Remediation Goals for Groundwater at CERCLA sites." November 6, 2001. Available at: www.epa.gov/superfund/health/contaminants/radiation/pdfs/9283_1_14.pdf..

[6] RDL value taken as 1/10 of the MCL value if not otherwise specified in the regulations.

[7] RDL value taken from "Radionuclides Notice of Data Availability Technical Support Document,"(March 2000). Available at: www.epa.gov/safewater/rads/tsd.pdf. 40 CFR 141.26(a)(2)(iii). See "Final Implementation Guidance for Radionuclides," EPA 816-F-00-002, March 2002. Available at: www.epa.gov/safewater/radionuclides/compliancehelp.html.

APPENDIX II. Example of High Radionuclide Concentration in Water (Radioanalytical Scenario 1)

Description

Surface water, storm water, drinking water, and estuaries have been impacted by an RDD. The specific radionuclides causing the radiological incident have not yet been determined, nor has their concentration in these samples. The event sequence in the laboratory assumes a single analyst following the analytical process chart, under conditions of single process stream. Analysis at this point is to assess if the 500-mrem AAL[1] values are exceeded by measurement of the sample's total gross radioactivity with hand-held survey instruments. These might include a survey meter or Geiger-Muller counter with appropriately calibrated beta and gamma detector probes or a micro-roentgen meter (gamma only).[2] This step would most likely be performed with the sample container, unopened, leaving the determination of " AAL values to the next step. Unless the identification of the radionuclide contamination is known, the hand-held survey instrument should be calibrated to respond to a gross screening $ and (concentration of 5.8×10^4 pCi/L; a ^{137}Cs calibration source should be used. If the identity of the radionuclide(s) is known, the ADL for the radionuclide listed for the 500-mrem value is to be used (see Table 5B, page 33). For survey instruments having an exposure rate readout, the instruments should be calibrated in terms of pCi/L per exposure unit readout for each container geometry expected and for the nuclide of interest (^{137}Cs for unidentified nuclides).

Event Sequence

It is Day 1 of the event. The incident responders have established a field office for coordinating response efforts, including a laboratory project manager. At 1200 hours of Day 1, the incident-response team sends a laboratory three water samples taken from the affected area that they believed to be significantly above background radiation levels. The samples arrive at the laboratory at *Day 1, 1500 hours.*

Analysis Path

Laboratory personnel perform an initial scan of the three 1-liter sample containers using a hand-held survey meter with appropriate detector probe obtaining the data in the table below. The average beta detection efficiency is 30%, and one may assume that the probe responds only to 10% of the decays from the sample bottle. Thus, the overall beta-detection efficiency for this scanning technique is 3 %. The overall gamma survey instrument response (a NaI(Tl) detector) conversion factor for this sample geometry (i.e., the one-liter sample bottle) is 53.6 pCi/(: R/h).

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[1] Depending on the time of the response, a 2-rem PAG may be applicable. If so, the radionuclide concentrations corresponding to the 2-rem PAG DWC can be calculated by taking the values for the 100-mrem column in the table and multiplying by 20.

[2] Some manufacturers have developed kits that include the survey meter plus an alpha–beta–gamma pancake GM detector and a NaI gamma detector.

Container ID	Gross Beta, cpm	Gross Gamma, : R/h
1	5,100	1,175
2	470	57
3	300	35
Background	300	35

Alpha analysis has not yet been performed on these samples. The sample measurements from the above table are converted to units comparable to those in Table 6A for Container 1 having a 1-L volume as follows:

$$\text{Gross Beta Activity} = \frac{(5100\text{-}300)\ \text{cpm}}{(3.7 \times 10^{-2}\,\text{dps/ pCi}) \times 60\ \text{s/ min} \times 0.03} = 72{,}070\ \text{pCi / L}$$

and

Gross Gamma Activity = (1,175-35 : R/h) × (53.6 pCi / : R/h) = 61,104 pCi/L.

The gross beta result exceeds the screening ADL of 2.9×10^4 pCi/L, and the gamma value exceeds the gross screening gamma ADL for ^{137}Cs in Table 5B (4.1×10^4 pCi/L), which take the sample priority to the **red** flow path for Container 1, Step 2, of Figure 2 (page 13).

A similar analysis for Container 2 yields 2,552 pCi/L beta and 1,179 pCi/L gamma. This takes us to the **green** flow path for Container 2 because it is less than the gross screening value of 2.9×10^4 pCi/L. Container 3 is measuring the equivalent of background dose rates, and at this point would be relegated to the **yellow** flow path. *The time is Day 1, 1600 hrs.*

Step 2, Container 1. A 5-mL aliquant of Container 1 is taken for gross alpha/beta analysis by liquid scintillation counting and gross gamma by Na(I)Tl. The net 15-min count rate for beta is 9.25×10^2 cpm (corrected for full open window efficiency of 0.60, yields 1.38×10^5 pCi/L), and for alpha is 1.14×10^2 cpm (corrected for full open window efficiency of 0.10, yields 1.02×10^5). The laboratory compares the pCi/L values with those in Tables 5A and 5B. The laboratory personnel will find that both alpha and beta values exceed the maximum ADL concentration listed (^{241}Am for alpha and ^{90}Sr for beta).

The laboratory notes that the liquid scintillation gross beta counts far exceed the survey instrument gross beta counts. This indicates the presence of low energy beta emitters that would not be detected by a survey instrument.

The gross gamma count of 2.65×10^2 cpm (corrected for 85% efficiency to 2.8×10^4 pCi/L) is also greater than the ADL concentration in Table 5B (1.6×10^4 for ^{60}Co). The well NaI(Tl) detector display indicates the presence of several gamma ray peaks in the spectrum. The sample stays on the fast track **(red)** for analysis.

The time is Day 1, 1700 hours.

Step 3, Container 1. The laboratory compares the results of the Step 2 screening analyses with the 500-mrem ADL concentrations for screening in Tables 5A and 5B and determines that ADL concentrations have been exceeded for Container 1 for all three classes of analytes (", $, and ().

The laboratory manager promptly notifies the IC that initial screening indicates that the 500-mrem AAL concentrations may have been exceeded for Container 1.

A sub-sample (aliquant) would be taken for each class of analysis (three total). While the digestions of the sub-samples for alpha (Step 4) and beta (Step 5) specific analyses are being performed, the third sample will be counted on an HPGe detector for about 1 hour (Step 6) for specific gamma ray identification.

The gamma spectrum will show net activity in several gamma peaks: 186, 295, 352, 609, 1,120, and 1,764 keV. These gamma peaks will be significantly above detector backgrounds for these energies, which correspond to ^{226}Ra (and ^{214}Pb/^{214}Bi progeny of ^{222}Rn and ^{226}Ra). This suggests to the analyst at least that ^{226}Ra is present. Activity estimates for ^{226}Ra can be made from the gamma-spectrometry data for the 186-keV peak. Due to the diffusion of ^{222}Rn from water, it is expected that equilibrium between ^{226}Ra and ^{222}Rn (and decay progeny) in the water sample will not be attained. As such, the ^{226}Ra activity estimates from the ^{226}Ra/^{222}Rn progeny photopeaks 295, 352, 609, 1,120, and 1,764 keV will be biased low. However, it will show that the total beta activity does not come from only the contribution of the radium progeny. *The time is Day 1, 1830 hours.*

NOTE: No peak at 661 keV for ^{137}Cs is found. The survey instruments used for screening analysis should be recalibrated with a gamma emitter that more closely matches the gamma energies of the ^{214}Pb/Bi radionuclides.

It must be kept in mind that the gamma spectrum has eliminated the possibility of ^{131}I and ^{137}Cs, for this sample. However, tritium must be analyzed specifically, as its presence cannot be detected with the initial survey instruments and may be obscured during the gross liquid scintillation analysis due to the presence of the other beta emitters in high concentrations (see caution about beta mismatch in the preceding note about Step 2). Thus, an aliquant of the original sample or that used for the gamma spectrometry should be distilled, and the distillate analyzed for tritium. Sample analysis for tritium indicates 80,000 pCi/L tritium present at *Day 1, 1930 hours.*

When the alpha- and beta-specific analyses are completed, only ^{90}Sr at 8,000 pCi/L, ^{226}Ra at 28,000 pCi/L (and their respective progeny) and ^{3}H at 80,000 pCi/L are found. It is important to note that the total gamma activity from ^{226}Ra and its decay products is only about 80% of the total beta activity from these radionuclides. This is due to the low abundance of the gamma rays from this group of radionuclides.

Step 15, Container 1. These values are reviewed and are within about 25% of predicted from the gross analysis performed in Step 2. The value for ^{226}Ra exceeds the 500-mrem ADL concentration of 460 pCi/L, ^{90}Sr value exceeds the 500-mrem ADL concentration of 6.0×10^{3}, and ^{3}H exceeds the 20,000 pCi/L MCL from the SDWA. These results are transmitted to the Incident Command Post. *The time is Day 1, 2030 hours.*

The remainder of the original sample is preserved, potentially for future analysis. The analysis of the container with the next highest priority based on dose would now proceed.

Step 7, Container 2. This container has initial measurements of 470 cpm beta and 57 : R/h gamma corresponding to 2,552 pCi/L[1] gross beta and 1,179 pCi/L gross gamma. It will follow the green flow path from Step 1. The analysis of a 5-mL aliquant for a 15-minute gross alpha/beta count by liquid scintillation will proceed.

Steps 8 and 9, Container 2. Step 7 yields a gross alpha value of 2.8×10^{11} cpm (corrected for full open window efficiency of 0.10, yields 2.52×10^{2} pCi/L) and gross beta value of 17 cpm (corrected for full open window efficiency of 0.60 , yields 2.55×10^{3} pCi/L). These, when compared to the values in Tables 5A and 5B, verify that the 500-mrem ADL concentrations have not been exceeded, but the 100-mrem ADL screening values of 2.0×10^{2} pCi/L (based on ^{241}Am) and 1.2×10^{3} (based on ^{90}Sr) have been exceeded. *The time is Day 1, 2100 hours.*

Step 10, Container 2. Analysis of alpha, beta, and gamma-specific radionuclides begins. Gamma spectrometry indicates no gamma rays are present except for those from ^{226}Ra progeny. *The time is Day 1, 2230 hours.*

The aliquant from Container 2 is analyzed for tritium directly and found to contain 1800 pCi/L. *The time is Day 1, 2330 hours.*

First results from the alpha- and beta-specific analyses are completed. *The time is Day 2, 0300 hours.*

All alpha- and beta-specific analyses are completed. Supervisory review of results is completed, identifying the presence of ^{226}Ra (6.3×10^{1} pCi/L) and ^{90}Sr (3.0×10^{2} pCi/L). *The time is Day 2, 1300 hours.*

Steps 15 and 16, Container 2. Comparison of the gross alpha and gross beta to the sum of the alpha- and beta-emitting radionuclides matches to within 30%. None of the individual values of the identified radionuclides exceed their respective 100-mrem ADL concentration. Nor does the sum of the fractions of the $- and (-emitting radionuclides (0.126) exceed the aggregate AAL (1.0).[2] Thus neither exceeds the 100-mrem level. Results are reported to the Incident Commander. The remainder of the original sample is preserved for future analysis. The analysis of the container with the next highest priority (based on dose) would now proceed. *The time is Day 2, 1500 hrs.*

Step 11, Container 3. Initial micro-R or survey meter screening of this sample resulted in a dose rate equivalent to background, and the sample aliquants analyzed by LSC also were equivalent to

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[1] (470-300)/[(0.03)(2.22) = 2,552 pCi/L beta, (57-35)[53.6 pCi/ (: R/h)] = 1,179 pCi/L gamma

[2] The sum of the fractions is calculated as follows using the values from Tables 10A and 10B (Appendix VI) under the 100-mrem level (green) columns (Note that the contribution from " emitters is not included as part of the sum of fractions.):

Radionuclide	Table 10A or 10B Value (pCi/L)	Sample Concentration From Radioanalytical Scenario (pCi/L)	Fraction
^{3}H	1.5×10^{6}	1.8×10^{3}	1.2×10^{-3}
^{90}Sr	2.4×10^{3}	3.0×10^{2}	1.25×10^{-1}
Sum	—	—	0.126

background in the short count. Following Step 9 on the decision tree, the gross beta-to-gamma ratio (Step 11) is calculated for a 10–15-mL aliquant of the sample (dried onto a planchet) and counted with a hand-held device. (It also would be possible to use the gross count data from the LSC and gamma spectrometry analyses to compute this value if more convenient for the analyst.) If the ratio is greater than 2.5, there is a strong possibility that ^{90}Sr is present and that analysis should be immediately initiated. Due to the low activity in this sample, it is unlikely that it has been affected by the event, but it is prudent to determine whether if abnormal levels of ^{90}Sr are present. Due to the low activity in this sample, it is unlikely that it has been affected by the event. It is preserved, and, if necessary, analysis may be resumed later at Step 12. *The time is Day 2, 1600 hours.*

Steps 12 and 13, Container 3. A 250-mL aliquant of the sample is counted by GPC to assess the gross alpha and beta values with respect to the maximum contaminant level (MCL). If gross alpha or gross beta is greater than 5 or 50 pCi/L, respectively, then the radionuclide-specific analyses should be performed if deemed necessary by the IC. If both are less than these values, the remainder of the original sample should be archived for analysis at a later time (Step 17). If this sample is less than both 5 and 50 pCi/L for alpha and beta, respectively, then it may be suitable as a drinking water source, and further analysis would be required. The actual gross alpha and beta results are 2 and 5 pCi/L, respectively. *The time is Day 2, 1800 hours.*

Steps 14 and 15, Container 3. The sample analyses have been completed for all alpha, beta and gamma emitters. Only traces of strontium above background (0.5 pCi/L) have been detected. The results are reviewed and transmitted to the IC. *The time is Day 2, 2100 hours.*

Elapsed time from receipt of samples at laboratory: 30 hours.

APPENDIX III. Example of Finding a Potable Water Source (Radioanalytical Scenario 2)

Description[1]

During the intermediate phase following the detonation of an RDD, sources of potable water will need to be evaluated for radioactive contamination. For this scenario, the priority switches from the high priority for high-activity samples (clearly not potable) to high priority for low-activity samples. Thus, all water samples are screened for gross alpha and beta radioactivity based on the MCL screening levels, and those samples having gross radioactivity concentrations *below* the MCL have priority for specific contaminant analyses. The radionuclide contaminants that initiated the incident should have been completely characterized by now under "Radioanalytical Scenario 1," and their results would lead into the specific radioanalytical processes. However, it is possible that the water sources may have other radionuclide contaminants, either related to the initial incident or from naturally occurring sources, which also will need to be characterized. It is important to note that the priority flow path for this scenario is set up the *opposite* of Radioanalytical Scenario 1: the high priority flow path is for those samples that have very low activity. Additionally the flow diagrams are based on the concept of establishing the MDC as the AAL. Thus, the values for the ADLs are calculated using Tables 11A and 12 in Appendix VI.

Event Sequence

It is Day 8 following an RDD event. The intermediate phase of the event is ongoing. The Incident Command Center has dispatched three samples to be assessed for their potential as drinking water sources for population areas where people will be returning to live.

The time frame for results is not as critical as in Radioanalytical Scenario 1, but prompt identification of drinking water sources is important in rebuilding public confidence in the cleanup effort. The only radionuclides that have been identified in any of the samples to date are ^{226}Ra (and its progeny), ^{3}H, and ^{90}Sr. The beta survey meter has been calibrated with a ^{90}Sr-specific source, and an overall efficiency for a 1 liter sample geometry is found to be 8%. The response of the micro-R meter to a radium source has been found to be 70 pCi/(:R/h).

The three samples arrive at the laboratory at 0800 on Day 8.

Analysis Path

The three samples are screened upon arrival using a micro-R meter and a beta survey meter, yielding the following results based on the instrument specific calibrations:

Sample Container	Container 5	Gross pCi/L	Container 6	Gross pCi/L	Container 7	Gross pCi/L	Instrument Background
Gross Beta, cpm	2,300	11,261	300	0	300	0	300
:R/h	38	210	36	70	35	0	35

[1] The events and radionuclides for Radioanalytical Scenario 2 are unrelated to Radioanalytical Scenario 1.

Container 5 is greater than the 100-mrem ADL concentration for ^{90}Sr (see Table 6B) and is set aside for analysis at a later date. Containers 6 and 7 are less than any 100 mrem values except for ^{228}Ra.

Steps 2a and 2b, Containers 6 and 7. The potential radionuclides are ^{226}Ra, ^{3}H, and ^{90}Sr. An 8-mL aliquant of each sample is counted for 100 minutes on a gas proportional counter (GPC) with the following results. (See Appendix VI, Table 12, for approximate counting times. Laboratory personnel should use specific correction factors from their instruments to determine these times).

Sample Container	Container 6	Container 7	Reagent Blank Background
GPC cpm, alpha	0.04	0.02	0.02
GPC cpm, beta	145	12.3	4.5

Container 6 gross beta result is greater than 10,000 pCi/L, and the high GPC result compared to the beta screening result indicates a low energy beta emitter. Therefore, it is checked for preservation requirements and stored for analysis in the near future (next day or two), continuing at Step 13.

Container 7 has a gross beta concentration of 84 pCi/L. This is possibly a potable water source depending upon the specific radionuclides contained in the sample. An aliquant is removed for tritium analysis (Step 4a), and will also be assessed using Steps 3, 4b, and 6. *It is Day 9, 0900 hours.*

Step 4b, Container 7. This analysis from Step 4a should be started prior to taking any other steps. An assessment of whether or not the ADL for tritium has been exceeded can be determined using LSC in about 40 minutes. For this sample, the tritium concentration is determined to be 580 pCi/L (the ADL for the analysis was determined to be 410 pCi/L). This confirms that Steps 3, 5, and 6 should proceed. *It is Day 9, 1400 hours.*

Steps 3, 5, and 6, Container 7. Due to the low reading on the micro-R or survey meter in Step 1, a larger sample size was taken for the sample in Step 2b. In order to approximate the RDL values in the SDWA, the lab selects a sample size commensurate with its normal water quality programs. Looking ahead to Step 6, the sample follows the path "5–15 pCi/L" to the next step, "Begin radionuclide-specific alpha analysis" (Step 8). Also, Step 5 divides at the 50 pCi/L level, significantly above this sample, so the next step is "begin radionuclide-specific beta analyses" (Step 7). Beta-specific and gamma analyses should be performed in parallel.

The alpha- and beta-specific analyses are completed, yielding values for ^{226}Ra of 3.6 pCi/L and for ^{90}Sr of 1.2 pCi/L. *It is Day 10, 1200 hours.*

Step 9, Container 7. While beta- and alpha-specific analyses are being performed, gamma spectrometry also should be performed on this sample. Dependent on detector efficiency and sample size used, the count time will be between about 1 to 4 hours. No gamma-ray emitters are identified in this sample, except for ^{214}Pb/^{214}Bi. Ra-228 analysis also is performed, and results are 1.1 pCi/L. *It is Day 8, 1800 hours.*

Steps 10 and 11, Container 7. The results from Steps 4b, 7, 8, and 9 are checked against the MCL and for Container 7. All are below the MCLs. The sum of the fractions of the MCLs for all beta-gamma radionuclides determined (^{3}H and ^{90}Sr) is 0.179. The value for ^{226}Ra + ^{228}Ra is 4.7 and is less than the MCL for drinking water. Because these values are less than their respective limits, the water may be acceptable as a potable water source. However, the laboratory should continue with all remaining samples because a single radiologically potable water supply may not be adequate. The analysis results are sent to the Incident Command Center. *It is Day 8, 2300 hours.*

Step 13, Container 6. Although this sample had a low overall micro-R or survey meter reading, it was preserved because of its statistically significant count rate above the reagent blank reading. The process, based on a time priority, would now pick up with this sample at Steps 4a and 4b.

Step 4a, Container 6. Tritium analysis is started on this sample while preparations are begun for specific alpha, beta, and gamma spectrometry analysis. Tritium in the sample is measured at 7,780 pCi/L. *The time is Day 8, 2400 hours.*

Step 3, Container 6. The gross beta value is ~20 pCi/L (Step 5, the majority of the original LSC response in Step 2 coming from tritium), and the gross alpha value is ~9 pCi/L (Step 8).

Step 5, Container 6. The gross beta concentration is less than 50 pCi/L, so beta-specific and gamma analyses should be performed (Steps 7 and 9). Gamma spectrometry indicates no other gamma emitters except for ^{214}Pb/^{214}Bi. Beta analyses indicate the presence of ^{90}Sr at 6.0 pCi/L. *The time is Day 9, 0400 hours.*

Steps 6 and 12, Container 6. The gross alpha indicates that it is not necessary to determine if uranium is present (Steps 12a and b). However, due to the nature of the event, uranium analysis by inductively coupled plasma-mass spectrometry is performed and subsequently shows that total uranium to be 2.7 pCi/L. The IC has requested that additional alpha specific analyses should be performed just to ensure that no other radionuclides are present (Step 8). *It is Day 9, 0200 hours.*

Step 8, Container 6. Alpha-specific analysis is performed for ^{226}Ra and indicates <1.5 pCi/L.

Steps 10 and 11, Container 6. None of the MCLs for the identified radionuclides, or the gross alpha or beta MCLs, has been exceeded. However, the sum of fractions is 1.139 form tritium and strontium. Results reported to the Incident Command Center. *The time is Day 9, 1000 hours.*

Steps 14a and b, Container 5. A 10-mL aliquant is taken from Container 5 for gross alpha and beta analysis by GPC. After counting, the values are gross alpha 3.88 pCi/L and gross beta 4.6×10^4 pCi/L. The high LSC beta value compared to the screening analysis indicates a low energy beta emitter is present. *It is Day 9, 1800 hours.*

Steps 4a and c, Container 5. LSC is performed on the sample for tritium and found to contain 35,000 pCi/L. As this is above the MCL for tritium, this sample is not suitable for drinking water. The result is reported to the IC. Other radiochemical analyses would be performed as necessary based on the requests from the IC.

The time is Day 9, 1900 hours.

Elapsed time from receipt of samples at laboratory: 35 hours.

APPENDIX IV. Radionuclide Contaminants are Known (Radioanalytical Scenario 3)

Description[1]

A public drinking water supply has been contaminated with a ^{90}Sr source. Major portions of the supply system have been isolated to prevent the spread of contamination into these portions of the system. Unlike the two earlier scenarios, the radionuclide is known. For this reason, the screening methods can be used with greater precision. For this scenario, the IC has decided that the analytical priority becomes low-activity samples because of a short-term need for reliable potable water sources. Water samples are screened only for gross beta activity based on the MCL screening levels for ^{90}Sr. The laboratory has adjusted calibration[2] of its screening survey equipment with ^{90}Sr, making the gross measurements more accurate. The efficiency with the open-end counter for ^{90}Sr is 18% for the sample geometry of a 1-L bottle. For this particular laboratory instrument, the ^{90}Sr MCL of 8.0 pCi/L would yield a net (^{90}Sr plus ^{90}Y) beta screen value of (3.2 ± 0.4) cpm. (The uncertainty is for illustrative purposes only.) Those samples having net beta activity *below* 3.2 cpm would be suspected of being below the MCL for ^{90}Sr concentration. The liquid scintillation instrument used by this laboratory has an overall efficiency for ^{90}Sr in aqueous samples of 86%, and a blank background of (2.40 ± 0.06) cpm.

The laboratory also has calibrated its gamma survey meter with a ^{137}Cs source yielding 0.017 pCi/cpm for the 1-L bottle. The radionuclide contaminants that initiated the incident should have been completely characterized using the "Radioanalytical Scenario 1" process. The water supplies sampled are likely to have radionuclide concentrations over the entire range previously seen from this event. Although the primary focus is on potable water supplies, it is of secondary importance to know where the activity is distributed in the water system. Thus, lower-priority samples (i.e., high activity) will need to be reported to the IC early on and will need to be analyzed eventually.

Event Sequence

It is *Day 3* following the dispersal of a large amount of ^{90}Sr into a drinking water supply. The source of the water in the pipeline is from a reservoir that has been analyzed and found to be uncontaminated. The intermediate phase of the event is ongoing. The Incident Command Center has dispatched three samples from different segments of the water distribution system to determine if these segments have already been contaminated.

The timing for results is as critical as in Radioanalytical Scenario 1 because the public water supply has been shut down temporarily. Rebuilding public confidence in the cleanup effort will be enhanced tremendously if portions of the system can be released for use. *The three samples arrive at the laboratory at 0800 hours on Day 3.* It is assumed that ^{90}Y is in full equilibrium with the ^{90}Sr when the samples arrive at the laboratory.

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[1]Radionuclide Scenario 3 is unrelated to either Scenarios 1 or 2.

[2]The instrumentation was calibrated previously with a ^{137}Cs source. The new calibration is with a ^{90}Sr source. Because ^{90}Sr will be in equilibrium with its ^{90}Y progeny, the instrument also will measure the ^{90}Y. Any ^{90}Sr dispersed into the water supply can be assumed to be in equilibrium with its progeny ^{90}Y (72 hours has already passed since the onset of the event), so the direct beta measurement will be a good approximation of the ^{90}Sr concentration.

Analysis Path

Step 1. The three samples are surveyed upon arrival using a survey meter that has a sliding metal window. The measurements for the three samples yield the following results for gross beta-gamma:

Sample Number	L271	L375	L446	Background
Instrument reading $ + (, cpm	26 ± 3	35 ± 3	85 ± 4	28 ± 3
Instrument reading (only, cpm	26 ± 2	26 ± 2	29 ± 3	25 ± 2

(Associated uncertainties are 1 sigma.)

The direction from the IC is to assess samples for potential as a source for drinking water. Since the event-specific radionuclide is known (^{90}Sr, Step 2$), the laboratory personnel use flowchart for Scenario 3 to get directly to Step 3$. *It is Day 3, 0830 hours.*

Step 3$1. Sample L271 indicates that it is close to background and apparently has no significant beta emitters based on the gross screen. A 10-mL aliquot is counted for 60 minutes using the LSC yielding a value of 100 pCi/L. Using Table 12 in Appendix VI, an MDC for a 10-mL sample and 60 minute count time is 210 pCi/L (this would be adjusted by the laboratory to its specific counting systems). The ADL for this measurement is 110 pCi/L.[1] Because this result is less than the ADL, its value is less than the MDC. Proceed to Step 4$1. *It is Day 3, 1000 hours.*

Both L375 and L446 yield significant beta and gamma count rates, and after Step 4 should be considered for other analyses if directed by the IC (Step 4$2).

Step 4$1. ^{90}Sr analysis is performed according to Standard Methods Procedure 7500-Sr (see reference on page 9). The final analytical value determined for ^{90}Sr is (1.95 ± 0.38) pCi/L, with an MDC of 0.84 pCi/L. Because this is less than the MCL, proceed to Step 5$1.[2] *It is Day 4, 1400 hours.*

Step 5$1. All other SDWA analyses are performed. The only other radionuclide identified is ^{226}Ra at a concentration of (2.6 ± 0.56) pCi/L, with an MDC of 0.90 pCi/L. *It is Day 4, 2300 hours.*

Step 6$1. The RDL value is 2.0 pCi/L for ^{90}Sr and 1.0 pCi/L for ^{226}Ra. Because ^{90}Sr has an MDC of 0.84 pCi/L, and ^{226}Ra has an MDC of 0.90 pCi/L, MQO requirements for both radionuclides have been met, and the data are deemed validated.

Step 7. The screening results were basically background. The low concentrations of the two radionuclides found are consistent with the background reading on the gross scan, and on the gross LSC analysis (the sum of the ^{90}Sr and ^{226}Ra would yield less than the gross counts background of 28 cpm for the survey meter, and the sum of the ^{90}Sr and ^{226}Ra progeny would yield less than the 100 pCi/L measured with the LSC gross screen).

[1]UBGR – LBGR = 210 – 0. u_{MR} = 210/3.29 = 64. ADL = MDC – 1.645 × 64 = 105 cpm.

[2]However, additional analyses will need to be done to ensure that MCLs for all radionuclides are met before the water supply is approved for consumption.

Step 8. The sum of the fractions does not need calculation unless tritium or other $ and (emitters are found in the sample. Ra-228 analysis will need to be done also to ensure compliance with the SDWA. [If previous results from this water source are available, this step may be omitted.]

Step 9. The IC is notified that water sample L271 has met the radionuclide requirements of the SDWA. Gross screening of samples L375 and L446 indicated that they contained high levels of radionuclides. Request direction as to whether or not detailed analyses on these sources should be performed.

The time is Day 5, 2400 hours.

Elapsed time from receipt of samples at laboratory: 40 hours.

APPENDIX V. Representative Analytical Processing Times

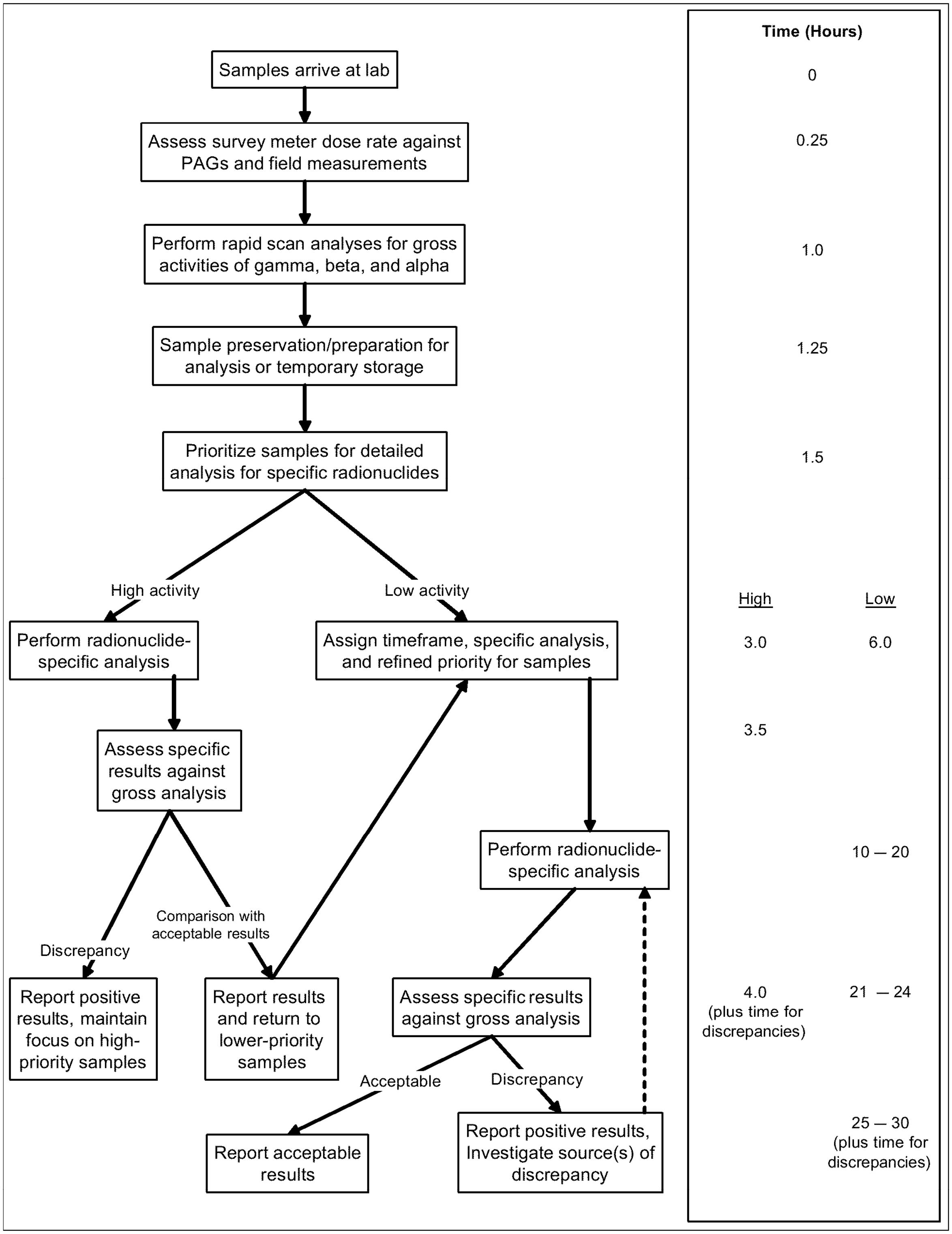

Figure 5 – Approximate Timeframe for Radiochemical Analyses (Radioanalytical Scenario 1)

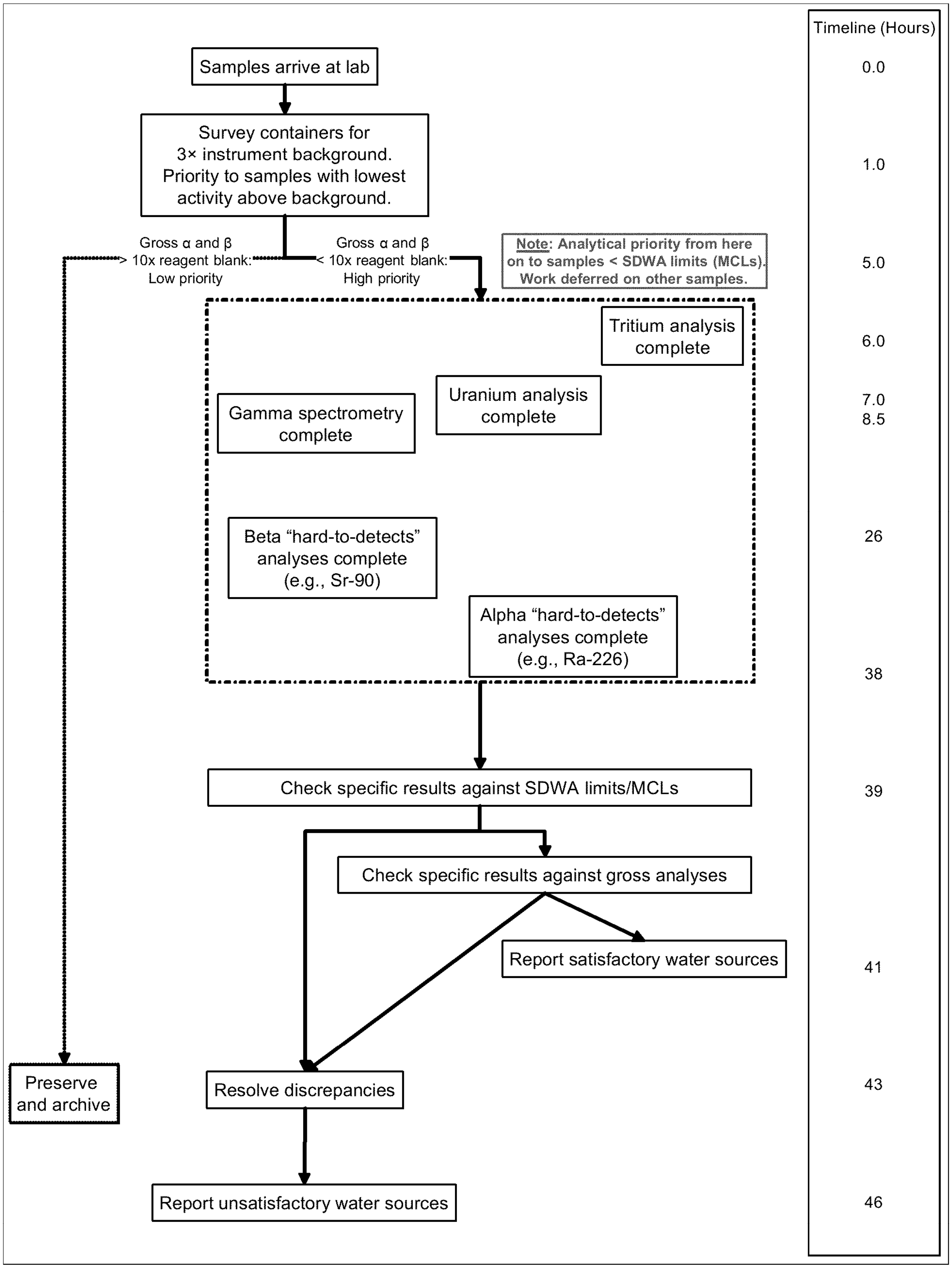

Figure 6 – Approximate Timeframe for Radiochemical Analyses (Radioanalytical Scenario 2)

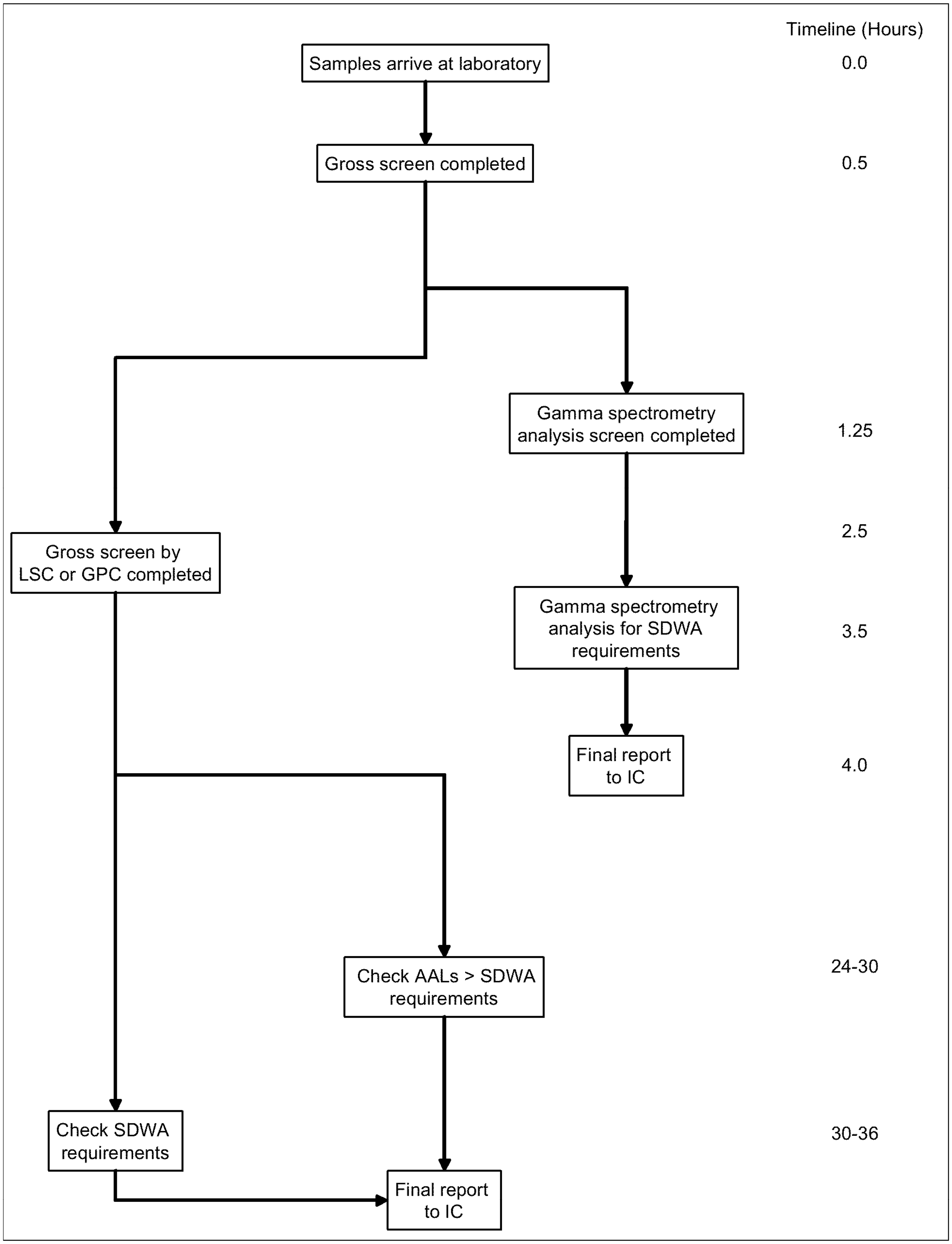

Figure 7 – Approximate Timeframe for Radiochemical Analyses (Radioanalytical Scenario 3)

APPENDIX VI. Establishing DQOs and MQOs for Incident Response Analysis

Three distinct radioanalytical scenarios are presented for water potentially contaminated with radionuclides. The first two assume that the mixture of radionuclides in the sample is unknown. In each scenario there is special emphasis on the implementation of the decision trees presented within that scenario for prioritizing sample processing by the laboratory. This is to support timely decision-making by the IC regarding actions to protect human health for the first two cases, and in the third case to expedite analysis so that suitable drinking water may be used. Specific MQOs are not given for the third radioanalytical scenario because the analytical action levels (AALs) and decision levels (DLs) default to the SDWA requirements (see Tables 7A and 7B). The screening analyses in this scenario are simply used for internal laboratory prioritization.

This appendix covers single-sample screening measurement decisions by the laboratory. The IC may need to make decisions based on the final radionuclide-specific concentrations based on the mean of the set of samples taken from an area. Measurement quality objectives (MQOs) would need to be developed separately for this case. The required method uncertainty (u_{MR}) should be smaller in this case compared to the laboratory's screening decisions, perhaps by a factor of three (See MARLAP Appendix C).

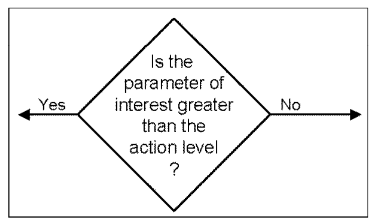

Figure 8 – A Decision Point in a Flowchart

The flowcharts depicted in this document contain decision points. There are three basic symbols on these flowcharts: Squares, which represent activities or tasks; diamonds, which represent decision points; and arrows, which represent flow of control. In these flow diagrams, there are many diamond-shaped decision points. Most often they are of the form shown in Figure 8. This is the general form of a theoretical decision rule as discussed in Step 5 of the data quality objectives (DQO) process. The parameter of interest usually is the "measurand" of the radiochemical analysis being performed (e.g., concentration of a radionuclide, total activity, etc.). The AALs will have been set according to criteria involving the appropriate PAGs or MCLs. The arrows specify the alternative actions to be taken.

The DQO process[1] may be applied to all programs involving the collection of environmental data with objectives that cover decisionmaking activities. When the goal of the study is to support decisionmaking, the DQO process applies systematic planning and statistical hypothesis testing methodology to decide between alternatives. Data quality objectives can be developed using the Guidance in EPA (2006) *Guidance on Systematic Planning Using the Data Quality Objectives Process (EPA QA/G-4)*. The DQO process is summarized in Figure 9.

Table 8 summarizes the DQO process. From these, MQOs can be established using the guidance in MARLAP. The information in this table should be sufficient to enable the decisionmaker and laboratory to determine the appropriate MQOs. The output should include an AAL, discrimination limit, gray region, null hypothesis, analytical decision level (referred to in MARLAP as "critical

[1] For appropriate samples, AALs and required detection limits are established in Safe Drinking Water Act regulations (see box 13 in Scenario 1 and boxes 4c, 5, 6, 11, and 12b in Scenario 2).

level"), and required method uncertainty at the AAL. A table summarizing DQO process for each decision point diamond can be prepared in advance and summarized as shown in Table 9.

Note that the existence of a decision point diamond implies that Steps 1-4 already have been determined.

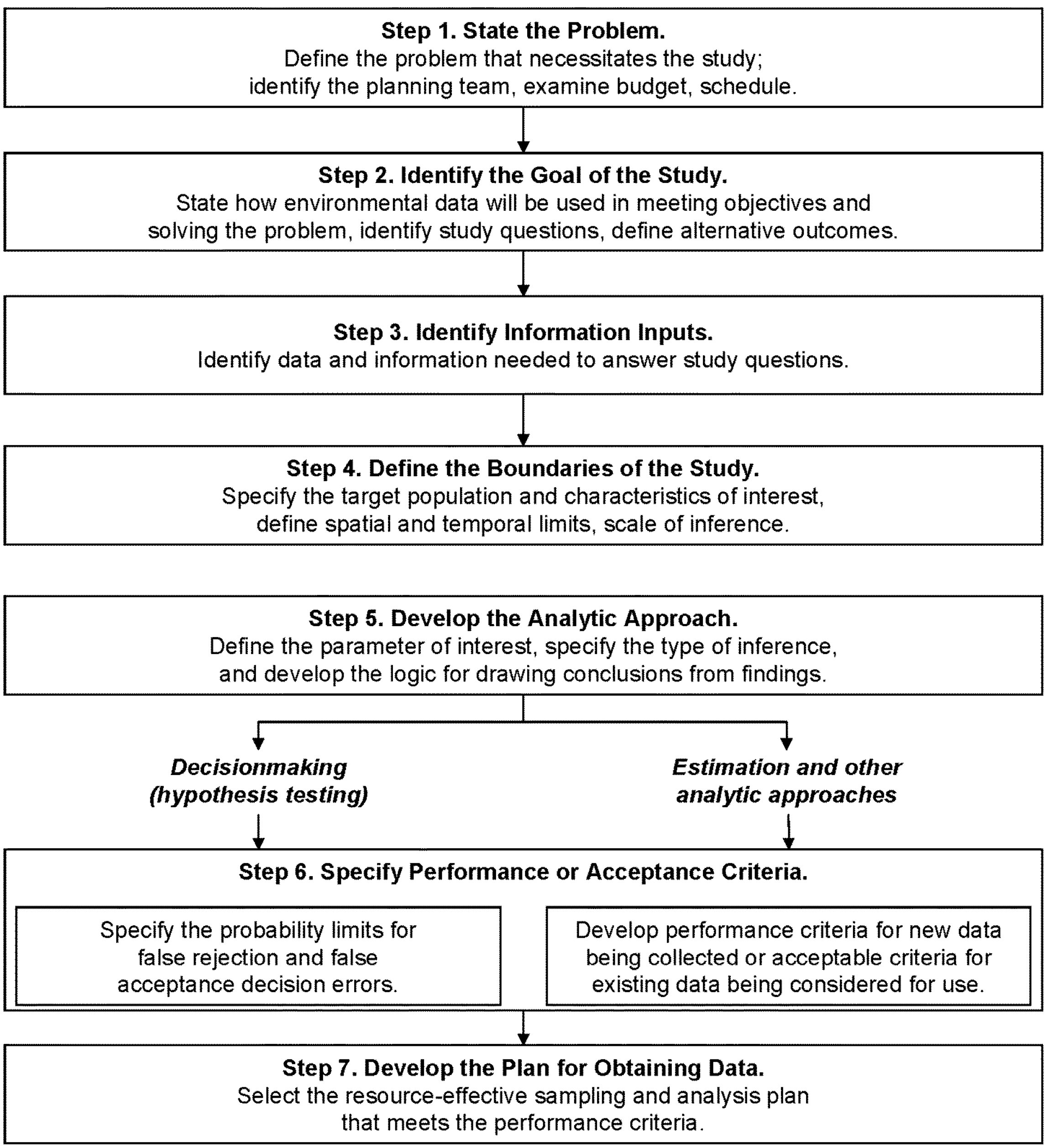

Figure redrawn from EPA G-4 (2006).

Figure 9 – The Data Quality Objectives Process

TABLE 8A – The DQO Process Applied to a Decision Point

STEP	OUTPUT
Step 1. Define the problem	… with a preliminary determination of the type of data needed and how it will be used; identify decisionmaker.
Step 2. Identify the decision	…among alternative outcomes or actions, and a list of decision statements that address the problem.
Step 3. Identify information needed for the decision	Analytical action levels that will resolve the decision and potential sources for these; information on the number of variables that will need to be collected; the type of information needed to meet performance or acceptance criteria; information on the performance of appropriate sampling and analysis methods.
Step 4. Define the boundaries of the study	Definition of the target population with detailed descriptions of geographic limits (spatial boundaries); detailed descriptions of what constitutes a sampling unit timeframe appropriate for collecting data and making the decision or estimate, together with any practical constraints that may interfere with data collection; and the appropriate scale for decisionmaking or estimation.
Step 5. Develop a decision rule ***This defines the decision point diamond.***	Identification of the population parameters most relevant for making inferences and conclusions on the target population; for decision problems, the "if..., then...else..." theoretical decision rule based upon a chosen AAL.

The theoretical decision rule specified in Step 5 can be transformed into statistical hypothesis tests that are applied to the data. Due to the inherent uncertainty with measurement data, there is some likelihood that the outcome of statistical hypothesis tests will lead to an erroneous conclusion, i.e., a decision error. This is illustrated in Table 8B.

TABLE 8B – Possible Decision Errors

	True Value of the parameter of interest	
Decision Made	**Greater than the AAL**	**Less than the AAL**
Decide that the parameter of interest is greater than the analytical action level	Correct decision	*Decision Error*
Decide that the parameter of interest is less than the analytical action level	*Decision Error*	Correct decision

In order to choose an appropriate null hypothesis (or baseline condition), consider which decision error should be more protected against. Choose the null hypothesis which if falsely rejected would cause the greatest harm. Then the data will need to be convincingly inconsistent with the null hypothesis before it will be rejected, and the probability of this happening (a Type I error) is more easily controlled during the statistical design. Using values from Table 8D, Figures 10 and 11 illustrate these concepts for case (a) and case (b) respectively.

Failing to detect a sample that exceeds the AAL could have consequences to public health. But screening additional samples will slow the overall process and therefore also may impact the public health. The probability that such decision errors occur are defined as the parameters " and $ in steps 6.1 and 6.2 in Table 8C. Values of alpha and beta should be set based on the consequences of making an incorrect decision. How these are balanced will depend on the AAL, sample loads, and other factors as specified by the IC.

The most commonly used values of alpha and beta are 5%, although this is by tradition and has no sound technical basis. These values may be used as a default, but should be optimized in Step 7 of the DQO process according to the actual risk of the decision error being considered.

TABLE 8C – The DQO Process Applied to a Decision Point

STEP	OUTPUT
Step 6. Specify limits on decision errors	

Step 6.1 Determine analytical action level (AAL) on the gray region boundary and set baseline condition (null hypothesis, H_0)	Which is considered the worse: decision error (a) deciding that the parameter of interest is less than the AAL when it actually is greater, or (b) deciding that the parameter of interest is greater than the AAL when it actually is less? Case (a) is usually considered to be a conservative choice by regulatory authorities, but this may not be appropriate in every case.
	
	If (a), the AAL defines the upper boundary of the gray region. The null hypothesis is that the sample concentration is above the AAL. (All samples will be assumed to be above the AAL unless the data are convincingly lower.) A desired limit will be set on the probability (") of incorrectly deciding the sample is below the AAL when the sample concentration is actually equal to the AAL.
	
	If (b), the AAL defines the lower boundary of the gray region. The null hypothesis is that the sample concentration is below the AAL. (All samples will be assumed to be below the AAL unless the data are convincingly higher.) A desired limit will be set on the probability (") of incorrectly deciding the sample is above the AAL when the sample concentration is actually equal to the AAL.

6.2 Define the discrimination limit (DL)	If (a), the discrimination limit defines the lower boundary of the gray region.[1] It will be a concentration below the AAL where the desired limit will be set on the probability ($) of incorrectly deciding the sample is above the AAL.
	
	If (b), the discrimination limit defines the upper boundary of the gray region.[2] It will be a concentration above the AAL where the desired limit will be set on the probability ($) of incorrectly deciding the sample is below the AAL.

6.3 Define the required method uncertainty at the AAL	According to MARLAP Appendix C, under either case (a) or case (b) above, the recommended required method uncertainty is: $$u_{MR} \leq \frac{UBGR - LBGR}{z_{1-\alpha} + z_{1-\beta}} = \frac{\Delta}{z_{1-\alpha} + z_{1-\beta}}$$ where $z_{1-"}$ and $z_{1-\$}$ are the 1–" and 1–$ quantiles of the standard normal distribution function.
Step 7. Optimize the design for obtaining data	Iterate steps 1–6 to define optimal values for each of the parameters and the measurement method required.

NOTES:

[1] The DL is the point where it is important to be able to distinguish expected signal from the AAL. When one expects background activity, then it might be zero. If one expects activity near the AAL, however, it might be at 90% of the AAL.

[2] The DL is the point where it is important to be able to distinguish expected signal from the AAL. If the AAL is near zero, the DL would define a concentration deemed to be too high to be undetected. Thus, the DL may be set equal to the MDC. If one expects activity near the AAL, however, it might be at 110% of the AAL.

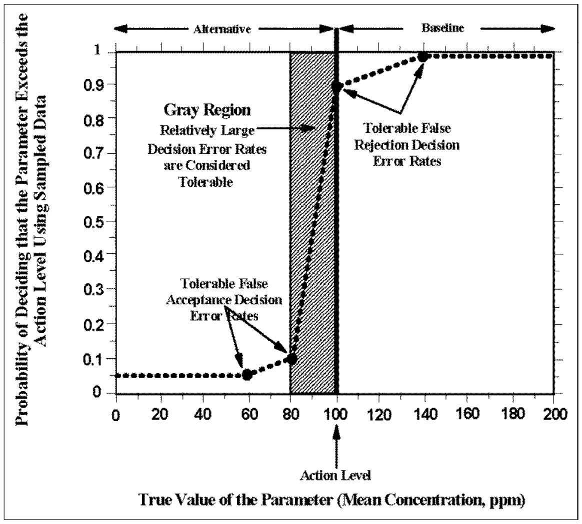

Figure 10 * Example Illustrating Case (a). Baseline Condition (null hypothesis): Parameter Exceeds the AAL

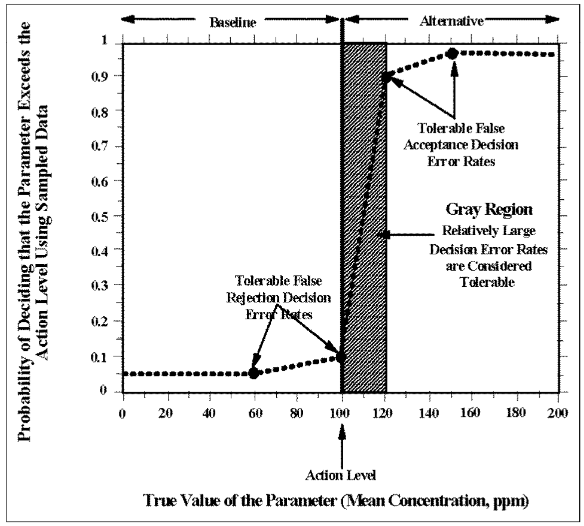

Figure 11 * Example Illustrating Case (b). Baseline Condition (null hypothesis): Parameter Does Not Exceed the AAL

Figures taken from EPA G-4 (2006)

In Figure 10, the AAL = 100, the DL = 80,) = 100 – 80 = 20 " = $ = 0.1 and

$$u_{MR} \leq \frac{\Delta}{z_{1-\alpha} + z_{1-\beta}} = \frac{20}{1.282 + 1.282} = 7.8 .$$

In Figure 11, the AAL = 100, the DL = 120,) = 120-100 = 20 " = $ = 0.1 and

$$u_{MR} \leq \frac{\Delta}{z_{1-\alpha} + z_{1-\beta}} = \frac{20}{1.282 + 1.282} = 7.8 .$$

Table 8D – Values of $z_{1-"}$ (or $z_{1-\$}$) for Some Commonly Used Values of " (or $)

" or $	$z_{1-"}$ (or $z_{1-\$}$)
0.001	3.090
0.01	2.326
0.025	1.960
0.05	1.645
0.10	1.282
0.20	0.842
0.30	0.524
0.50	0.000

The concentration that indicates the division between values leading to rejecting the null hypothesis and those that do not is termed the "critical level." Possible values of the concentration can be divided into two regions, the acceptance region and the rejection region. If the value of the concentration comes out to be in the acceptance region, the null hypothesis being tested is not rejected. If the concentration falls in the rejection region, the null hypothesis is rejected. The set of values of a statistic that will lead to the rejection of the null hypothesis tested is called the critical region. Critical region is a synonym for rejection region.

In the context of analyte detection, the *critical value* (see MARLAP Attachment 3B.2) is the minimum measured value (e.g., of the instrument signal or the *analyte* concentration) required to give confidence that a positive (nonzero) amount of *analyte* is present in the material analyzed. The critical value is sometimes called the *critical level*.

In case (a), the critical value will be UBGR – $z_{1-"}$ u_M, where u_M is its combined standard uncertainty of the measurement result, x. Only measurement results less than the critical value will result in rejecting the null hypothesis that the true concentration is greater than the AAL.

In case (b), the critical value will be LBGR + $z_{1-"}$ u_M, where u_M is its combined standard uncertainty of the measurement result, x. Only measurement results greater than the critical value will result in rejecting the null hypothesis that the true concentration is less than the AAL. This process can be completed for each diamond in each flowchart to fill in Table 12. In these tables, all values have been rounded to 2 significant figures.

In the following tables, MQOs were determined for screening using a discrimination level of zero and Type I and Type II error rates of alpha = beta = 0.05. These are the MQOs usually associated with developing MDCs and result in a relative method uncertainty of 30% at the AAL, and an ADL value of 0.5 times the AAL.

For radionuclide specific measurements, the requirements are more stringent, using a discrimination level of one-half the AAL and Type I and Type II error rates of alpha = 0.01 with beta = 0.05. This results in a relative method uncertainty of 13% at the AAL and an ADL value of 0.71 times the AAL. Note that gamma spectrometric measurements using an HPGe are always radionuclide specific, and therefore, have the more stringent MQOs.

TABLE 9A – DQOs and MQOs for Radioanalytical Scenario 1. Prioritization Decisions Based on Screening[7] (Gross ", $, or (Measurements)

Measurement Rectangle	Decision Point Diamond	Type of Analysis, ", $, or (	Analytical AL (pCi/L)	Null Hypothesis H_0 Choose > AAL or < AAL i.e., case (a) or case (b)	DL DL < AAL in case (a) and DL > AAL in case (b)	) = UBGR-LBGR	Type I error rate "	Type II error rate $	u_{MR}	n_{MR} [6]	RDL or MDC	Analytical Decision Level (Critical Level) (pCi/L)	Source of AAL
	1a	([1]	58,000	a	0	58,000	0.05	0.05	18,000	0.30	58,000	29,000	500 mrem ^{137}Cs
2,7	3,8	"	2,000	a	0	2,000	0.05	0.05	610[2, 3]	0.30		1,000	500 mrem ^{241}Am
2,7	9	"	400	a	0	400	0.05	0.05	120[3]	0.30		200	100 mrem ^{241}Am
2,7	3,8	$	12,000	a	0	12,000	0.05	0.05	3,600[3]	0.30		6,000	500 mrem ^{90}Sr
2,7	9	$	2,400	a	0	2,400	0.05	0.05	720[3]	0.30		1200	100 mrem ^{90}Sr
2,7	3,8	(	33,000	a	16,500	16,500	0.01	0.05	4,100[3]	0.13		23,000	500 mrem ^{60}Co
2,7	9	(	6,600	a	3,300	3,300	0.01	0.05	830[3]	0.13		4,600	100 mrem ^{60}Co
	11[4]			a									
12	13	"	15	a							3	15	SDWA
12	13	$	50	a							5	50	SDWA
	15[5]												

Notes:

[1] Using survey instrument calibrated to ^{137}Cs on contact in the recommended geometry.

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[2] $u_{MR} \leq \frac{\Delta}{z_{1-\alpha} + z_{1-\beta}} = \frac{2000}{1.645 + 1.645} = \frac{2000}{3.29} \approx 610$

[3] Diamond 9 is the limiting decision criterion.

[4] Mathematically computed from data obtained earlier.

[5] Based on professional judgment from data obtained earlier. The comparison made is based on the MQOs established for the screening analyses and the individual radionuclide analyses. The acceptability of this measurement will vary widely based on the actual radionuclides in the sample and the radionuclides used to calibrate the screening instruments. Thus it will be incumbent on the laboratory staff to assess the agreement of these numbers. Guidance given in the document is a ratio range of *approximately* 0.5 to 2.0.

[6] The value for n$_{MR}$ (relative required method uncertainty) is determined by dividing the value of u_{MR} by the AAL (fourth column in this table).

[7] Values for gamma analysis assume radionuclide-specific analyses using an HPGe. If a gamma detector of lower resolution is used, the screening error rates for gamma analysis should be changed to that of the alpha and beta analysis.

TABLE 9B – DQOs and MQOs for Scenario 1. Values Reported Externally Based on Radionuclide-Specific Measurements

Measurement Rectangle	Decision Point Diamond	Type of Analysis, " , $, or (	Analytical AL (pCi/L)	Null Hypothesis H_0 Choose > AAL or < AAL i.e., case (a) or case (b)	DL DL < AAL in case (a) and DL > AAL in case (b)	) = UBGR-LBGR	Type I error rate "	Type II error rate $	u_{MR}	n$_{MR}$ [2]	RDL or MDC	Analytical Decision Level (Critical Level) (pCi/L)	Source of AAL
4		"	See Tables 10A and 10B	a	0.5 AAL	0.5 AAL	0.01	0.05	AL/8	0.13		0.71×AAL[1]	100 mrem AAL
5		$		a	0.5 AAL	0.5 AAL	0.01	0.05	AL/8	0.13		0.71×AAL	100 mrem AAL
6		(		a	0.5 AAL	0.5 AAL	0.01	0.05	AL/8	0.13		0.71×AAL	100 mrem AAL
10		"		a	0.5 AAL	0.5 AAL	0.01	0.05	AL/8	0.13		0.71×AAL	100 mrem AAL
10		$ (		a	0.5 AAL	0.5 AAL	0.01	0.05	AL/8	0.13		0.71×AAL	100 mrem AAL
14		"		a	0.5 AAL	0.5 AAL	0.01	0.05	AL/8	0.13		0.71×AAL	100 mrem AAL
14		$ (		a	0.5 AAL	0.5 AAL	0.01	0.05	AL/8	0.13		0.71×AAL	100 mrem AAL

Note:

[1] In case (a), the critical value is UBGR – $z_{1\text{--}"}$ u_M = AAL – $z_{1-0.01}$ [ )/($z_{1-0.01}$ + $z_{1-0.05}$)] = AAL – 2.326[(AAL–0.5 AAL)/(2.326 + 1.645)]
= AAL – 2.326(AAL / 8) . 0.71 AAL. Specific values for the ADL are listed in Tables 6A or 6B.

[2] The value for n$_{MR}$ (relative required method uncertainty) is determined by dividing the value of u_{MR} by the AAL (fourth column in this table).

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TABLE 10A – Derived Water Concentrations (DWC) Corresponding to "-Emitting Radionuclide Analytical Action Levels

Radionuclide	Half-Life	Additional Emissions	pCi/L	
			500-mrem AAL [1] [2]	**100-mrem AAL** [1] [2] [3]
Gross " Screen [5]	–	–	2.0×10^{3}	400
Am-241	432.2 y	(	2.0×10^{3}	400
Cm-242	162.8 d		1.4×10^{4}	2.8×10^{3}
Cm-243	29.1 y	(	2.5×10^{3}	500
Cm-244	18.10 y		2.9×10^{3}	580
Np-237 [4]	2.144×10^{6} y	(	3.9×10^{3}	780
Po-210	138.4 d		130	26
Pu-238	87.7 y		1.8×10^{3}	360
Pu-239	2.411×10^{4} y		1.7×10^{3}	340
Pu-240	6.564×10^{3} y		1.7×10^{3}	340
Ra-226 [4]	1.600×10^{3} y	(DP	910	180
Th-228 [4]	1.912 y	(DP	2.6×10^{3}	520
Th-230	7.538×10^{4} y		1.8×10^{3}	360
Th-232	1.405×10^{10} y	(DP	1.6×10^{3}	320
U-234	2.455×10^{5} y	(DP	6.3×10^{3}	1300
U-235	7.038×10^{8} y	(DP	6.6×10^{3}	1300
U-238	4.468×10^{9} y	(DP	7.0×10^{3}	1.4×10^{3}

Notes:

The half-lives of the nuclides are given in years (y) or days (d). DP refers to "decay products."

[1] Values are based on the dose conversion factors in Federal Guidance Report No.13, CD Supplement, 5-year-old child and the 50th percentile of water consumption.

[2] 365-day intake.

[3] The-100 mrem AAL values were obtained by dividing 500-mrem PAG DWC values by 5. AALs have been rounded to 2 significant figures.

[4] Includes decay products originating from the ^{226}Ra or ^{228}Th in the body. Used only to calculate the concentration (pCi/L) or dose from ^{226}Ra or ^{228}Th in the body.

[5] The AAL and associated u_{MR} and ADL values for ^{241}Am are used as the default for gross alpha screening analysis.

TABLE 10B – Derived Water Concentrations (DWC) Corresponding to $-Emitting Radionuclide AALs

Radionuclide	Emission Type	Half-Life	pCi/L 500-mrem AAL [1] [2]	pCi/L 100-mrem AAL [1] [2] [3]
Beta Gamma Screen [4]	$	–	5.8×10^{4}	1.2×10^{4}
Ac-227DP	$ (" DP)	21.77 y	1.1×10^{3}	220
Ce-141	$(	32.51 d	2.2×10^{5}	4.4×10^{4}
Ce-144	$(	284.9 d	2.9×10^{4}	5.8×10^{3}
Co-57	(	271.1 d	6.3×10^{5}	1.3×10^{5}
Co-60	$(	5.270 y	3.3×10^{4}	6.6×10^{3}
Cs-134	$(	2.065 y	4.3×10^{4}	8.6×10^{3}
Cs-137	$(	30.07 y	5.8×10^{4}	1.2×10^{4}
H-3	weak $	12.32 y	7.7×10^{6}	1.5×10^{6}
I-125	(	59.40 d	1.3×10^{4}	2.6×10^{3}
I-129	$(	1.57×10^{7} y	3.3×10^{3}	660
I-131	$(	8.021 d	5.4×10^{3}	1.1×10^{3}
Ir-192	$(	73.83 d	1.2×10^{5}	2.4×10^{4}
Mo-99	$ (((DP)	65.94 h	3.2×10^{5}	6.4×10^{4}
P-32	$	14.26 d	5.9×10^{4}	1.2×10^{4}
Pd-103	(	16.99 d	7.8×10^{5}	1.6×10^{5}
Pu-241	$	14.29 y	1.0×10^{5}	2.0×10^{4}
Ra-228	$ ((DP)	5.75 y	160	32
Ru-103	$(	39.26 d	2.3×10^{5}	4.6×10^{4}
Ru-106	$(	373.6 d	2.2×10^{4}	4.4×10^{3}
Se-75	(	119.8 d	6.7×10^{4}	1.3×10^{4}
Sr-89	$	50.53 d	6.3×10^{4}	1.3×10^{4}
Sr-90	$	28.79 y	1.2×10^{4}	2.4×10^{3}
Tc-99	$(	2.11×10^{5} y	2.4×10^{5}	4.8×10^{4}

Notes:

The half-lives of the nuclides are given in years (y), days (d), or hours (h). DP refers to "decay products."

[1] Values are based on the dose conversion factors in Federal Guidance Report No.13, CD Supplement, 5-year-old child and the 50th percentile of water consumption.

[2] 365-day intake.

[3] The 100-mrem AAL values were obtained by dividing 500-mrem PAG DWC values by 5. AALs have been rounded to 2 significant figures.

[4] The AAL and associated u_{MR} and ADL values for ^{137}Cs are used as the defaults for initial beta gamma screening analysis on sample bottle (Step 1 in Radioanalytical Scenarios 1 and 2). The AAL and associated u_{MR} and ADL values for ^{60}Co concentration are used as defaults for gross gamma measurements thereafter (see text). The AAL and associated u_{MR} and ADL values for ^{90}Sr are the defaults used for gross beta screening.

Several nuclides in Table 10B decay by electron capture. These radionuclides cannot be detected using gross $ analysis. The electron capture decay leads to characteristic X-rays of the progeny nuclide. The most effective way to detect the X-rays from these electron-capture-decay radionuclides is either with a low-energy photon detector (LEPD) or a reverse electrode germanium detector (N-type semiconductor detector). The lower range of energy with these detectors is about 10 keV.

TABLE 11A – DQOs and MQOs for Scenario 2. Internal Lab Prioritization Decisions Based on Screening (Gross ", $, or (Measurements)

Measurement Rectangle	Decision Point Diamond	Type of Analysis, " , $, or (	Analytical AL (pCi/L)	Null Hypothesis H_0 Choose > AAL or < AAL i.e. case (a) or case (b)	DL DL < AAL in case (a) and DL > AAL in case (b)	) = UBGR-LBGR	Type I error rate "	Type II error rate $	u_{MR}	n_{MR} [3]	RDL or MDC	Analytical Decision Level (Critical Level) (pCi/L)	Source of AAL
	1	([1]	12,000	a	0	12,000	0.05	0.05	3,600	0.30	12,000	6,000	100 mrem ^{137}Cs AAL
2a	2b	"	210	a	0	210	0.05	0.05	64	0.30	210	110	LSC MDC 5mL 10 min [2]
2a	2b	$	820	a	0	820	0.05	0.05	250	0.30	820	410	LSC MDC 5mL 10 min [2]
14a	14b	"	210	a	0	210	0.05	0.05	64	0.30	210	110	LSC MDC 5mL 10 min [2]
14a	14b	$	820	a	0	820	0.05	0.05	250	0.30	820	410	LSC MDC 5m: 10 min [2]
3	5	$	50								5	50	SDWA
3	6	"	15								3	15	SDWA

Notes:

[1] Using survey instrument calibrated to ^{137}Cs on contact.

[2] See Table 12.

[3] The value for n_{MR} is determined by dividing the value of u_{MR} by the AAL (fourth column in this table).

TABLE 11B – DQOs and MQOs for Scenario 2. Values Reported Externally Based on Radionuclide-Specific Measurements

Measurement Rectangle	Decision Point Diamond	Type of Analysis, " , $, or (	Analytical AL (pCi/L)	Null Hypothesis H_0 Choose > AAL or < AAL i.e. case (a) or case (b)	DL DL < AAL in case (a) and DL > AAL in case (b)	) = UBGR-LBGR	Type I error rate "	Type II error rate $	u_{MR}	n_{MR}	RDL	Analytical Decision Level (Critical Level) (pCi/L)	Source of AAL
7	11	$	See Tables 7A and 7B								See Tables 7A and 7B		SDWA
8	11	"											SDWA
9	11	(											SDWA
4a	4b, 4c	^{3}H	20,000								1,000	20,000	SDWA
12a	12b	U	20 [1]								0.3	20	SDWA

Note:

[1] 20 pCi/L = 30 ppb U. The measurement of uranium can be based on mass or activity using appropriate conversion factors.

Estimates of nominal *a priori* minimum detectable concentrations (MDC) for two commonly used gross alpha and beta screening methods, using liquid scintillation and gas proportional counting, have been summarized in Table 12. The table provides estimates of MDCs as a function of sample aliquant volume and sample counting times. The MDCs were calculated using the working expressions provided by Currie[1], assuming paired observations having equal counting times for background and sample measurements and Type I and II error probabilities of 5%. The table notes provide the typical modern instrument detector efficiencies and background count rates used to calculate the MDC values. Critical levels (L_c) are one-half the MDCs.

TABLE 12 – Minimum Detection Concentration Values for Various Counting Times and Sample Volumes

Liquid Scintillation Counting

Emission Type	Alpha	Alpha	Alpha	Alpha	Alpha	Beta	Beta	Beta	Beta	Beta
Volume (mL)	10	10	10	10	10	10	10	10	10	10
Count Time (m)	1	5	10	30	60	1	5	10	30	60
MDC (pCi/L)	590	210	140	77	53	1,720	730	510	290	210
L_c (pCi/L)	295	105	120	38.5	26.5	860	365	255	145	105

Emission Type	Alpha	Alpha	Alpha	Alpha	Alpha	Beta	Beta	Beta	Beta	Beta
Volume (mL)	5	5	5	5	5	5	5	5	5	5
Count Time (m)	1	5	10	30	60	1	5	10	30	60
MDC (pCi/L)	880	320	210	110	79	2,760	1,170	820	470	330
L_c (pCi/L)	440	160	105	55	39.5	1,380	585	410	235	115

Assumptions for 5-mL sample: alpha detector efficiency = 0.8; alpha background cpm = 1.2; beta detector efficiency = 1.0; beta background cpm = 36

Gas Proportional Counting

Emission Type	Alpha	Alpha	Alpha	Alpha	Alpha	Beta	Beta	Beta	Beta	Beta
Volume (mL)	10	10	10	10	10	10	10	10	10	10
Count Time (m)	1	5	10	30	60	1	5	10	30	60
MDC (pCi/L)	1,880	540	330	160	110	1,230	450	300	160	110
L_c (pCi/L)	940	270	165	80	55	615	225	150	80	105

Emission Type	Alpha	Alpha	Alpha	Alpha	Alpha	Beta	Beta	Beta	Beta	Beta
Volume (mL)	5	5	5	5	5	5	5	5	5	5
Count Time (m)	1	5	10	30	60	1	5	10	30	60
MDC (pCi/L)	3,770	1,080	660	320	210	2,470	900	600	330	230
L_c (pCi/L)	1,885	540	330	160	105	1,235	450	300	165	115

Assumptions: alpha detector efficiency = 0.10; alpha background cpm = 0.10; beta detector efficiency = 0.30; beta background cpm = 1.4

[1]Currie, Lloyd. 1968. "Limits for Qualitative Detection and Quantitative Determination: Application to Radiochemistry." Analytical Chemistry 40(3): 586-593.

APPENDIX VII. Glossary

accuracy**:** The closeness of a measured result to the true value of the quantity being measured. Various recognized authorities have given the word "accuracy" different technical definitions, expressed in terms of bias and imprecision. Following MARLAP, this document avoids all of these technical definitions and uses the term "accuracy" in its common, ordinary sense.

aerosol: A suspension of fine solid or liquid particles within a gaseous matrix (usually air).

aliquant**:** A representative portion of a homogeneous *sample* removed for the purpose of analysis or other chemical treatment. The quantity removed is not an evenly divisible part of the whole sample. An aliquot, by contrast, is an evenly divisible part of the whole.

analyte**:** See *target analyte.*

analytical action level (AAL): The value of a quantity that will cause the decisionmaker to choose one of the alternative actions. The *analytical action level* may be a derived concentration level (such as the *derived water concentration* in this document), background level, release criteria, regulatory decision limit, etc. The AAL is often associated with the type of media, *target analyte*, and concentration limit. Some AALs, such as the release criteria for license termination, are expressed in terms of dose or risk. MARLAP uses the term "action level." See *total effective dose equivalent (TEDE)*.

analytical decision level (ADL): The minimum measured value for the radionuclide concentration in a sample that indicates the amount of radionuclide present is equal to or greater than the *analytical action level* at a specified *Type II error* rate (assumes that *method uncertainty* requirements have been met). Any measurement result equal to or greater than the applicable ADL is considered to have exceeded the corresponding *analytical action level*. MARLAP uses the term "*critical level*."

background (instrument)**:** Radiation detected by an instrument when no *source* is present. The background radiation that is detected may come from radionuclides in the materials of construction of the detector, its housing, its electronics, and the building, as well as the environment and natural radiation.

background level**:** A term that usually refers to the presence of radioactivity or radiation in the environment. From an analytical perspective, the presence of background radioactivity in samples needs to be considered when clarifying the radioanalytical aspects of the decision or study question. Many radionuclides are present in measurable quantities in the environment.

bias (of a measurement process)**:** A persistent deviation of the mean measured result from the true or accepted reference value of the quantity being measured, which does not vary if a measurement is repeated.

blank (analytical or method)**:** A *sample* that is assumed to be essentially free of the *target analyte* (the "unknown"), which is carried through the radiochemical preparation, analysis, mounting, and measurement process in the same manner as a routine sample of a given matrix.

calibration**:** The set of operations that establishes, under specified conditions, the relationship between values indicated by a measuring instrument or measuring system, or values represented by a material measure, and the corresponding known value of a parameter of interest.

calibration source**:** A prepared *source*, made from a *certified reference material*, that is used for calibrating instruments.

certified reference material**:** A radioactive material, accompanied by an uncertainty at a stated level of confidence, with one or more values certified by a procedure that establishes its traceability to accepted standard values. A "standard reference material" is a certified reference material issued by the National Institute of Standards and Technology (NIST) in the United States. NIST certifies a standard reference material for specific chemical or physical properties and issues it with a certificate that reports the results of the characterization and indicates the intended use of the material.

chain of custody**:** Procedures that provide the means to trace the possession and handling of a sample from collection to data reporting.

check source**:** A material used to validate the operability of a radiation measurement device, sometimes used for instrument quality control. See *source, radioactive.*

critical level: Termed *analytical decision level* in this document in the context of evaluating sample results relative to an *analytical action level*. In the context of analyte detection, *critical level* means the minimum measured value (e.g., of the instrument signal or the radionuclide concentration) that indicates a positive (nonzero) amount of a radionuclide is present in the material within a specified probable error. The critical level is sometimes called the *critical value* or *decision level*.

data quality objective* (*DQO): Qualitative and quantitative statements that clarify the study objectives, define the most appropriate type of data to collect, determine the most appropriate conditions from which to collect the data, and specify tolerable limits on decision error rates. Because DQOs will be used to establish the quality and quantity of data needed to support decisions, they should encompass the total *uncertainty* resulting from all data collection activities, including analytical and sampling activities.

derived radionuclide concentration (DRC): General application term used in discussions involving both of the terms *derived air concentration* and *derived water concentration.*

derived water concentration (DWC): The concentration of a radionuclide, in pCi/L, that would result in exposure to a specified dose level. Generally refers to a *protective action guide* or other specified dose- or risk-based factor related to an *analytical action level*. In this document, for example, the "500-mrem DWC for ^{239}Pu" is the concentration of ^{239}Pu, in pCi/L, that would result in an exposure of 500 mrem and would refer to the 500-mrem PAG. The DWC is radionuclide-specific.

discrimination limit (DL): The DL is the point where it is important to be able to distinguish expected signal from the *analytical action level.* The boundaries of the *gray region*.

***dose equivalent*:** Quantity that expresses all radiations on a common scale for calculating the effective absorbed dose. This quantity is the product of absorbed dose (*grays* (Gy) or rads) multiplied by a quality factor and any other modifying factors (MARSSIM, 2000). The quality factor adjusts the absorbed dose because not all types of ionizing radiation create the same effect on human tissue. For example, a dose equivalent of one *sievert* (Sv) requires 1 Gy of beta or gamma radiation, but only 0.05 Gy of alpha radiation or 0.1 Gy of neutron radiation. Because the sievert is a large unit, radiation doses often are expressed in millisieverts (mSv). See *total effective dose equivalent* and *roentgen.*

***gray (Gy)*:** The International System of Units (SI) unit for absorbed radiation dose. One gray is 1 joule of energy absorbed per kilogram of matter, equal to 100 *rad*. See *sievert*.

***gray region*:** The range of possible values in which the consequences of decision errors are relatively minor. Specifying a gray region is necessary because variability in the analyte in a population and imprecision in the measurement system combine to produce variability in the data such that the decision may be "too close to call" when the true value is very near the *analytical action level*. The *gray region* establishes the minimum distance from the *analytical action level* where it is most important to control *Type II decision errors*.

***incident of national significance (INS)*:** An actual or potential high-impact event that requires a coordinated and effective response by and appropriate combination of federal, state, local, tribal, nongovernmental, or private-sector entities in order to save lives and minimize damage, and provide the basis for long-term community recovery and mitigation activities.

***measurement quality objective* (*MQO)*:** The analytical data requirements of the *data quality objectives*, which are project- or program-specific and can be quantitative or qualitative. These analytical data requirements serve as measurement performance criteria or objectives of the analytical process. MARLAP refers to these performance objectives as MQOs. Examples of quantitative MQOs include statements of required analyte detectability and the *uncertainty* of the analytical protocol at a specified radionuclide concentration, such as the *analytical action level*. Examples of qualitative MQOs include statements of the required specificity of the analytical protocol (e.g., the ability to analyze for the radionuclide of interest (or *target analyte*) given the presence of interferences).

***method uncertainty*:** The predicted *uncertainty* of the result that would be measured if the method were applied to a hypothetical laboratory *sample* with a specified analyte concentration. Although individual measurement uncertainties will vary from one measured result to another, the *required method uncertainty* is a target value for the individual measurement uncertainties and is an estimate of uncertainty before the sample is actually measured. See also *uncertainty*, *required method uncertainty*, and *relative required method uncertainty*.

***method validation*:** The demonstration that the method selected for the analysis of a particular analyte in a given matrix is capable of providing analytical results to meet the project's *measurement quality objectives* and any other requirements in the analytical protocol specifications.

***minimum detectable concentration (MDC)*:** An estimate of the smallest true value of the analyte concentration that gives a specified high probability of detection.

***nuclide-specific analysis*:** Radiochemical analysis performed to isolate and measure a specific radionuclide.

***null hypothesis (H_0)*:** One of two mutually exclusive statements tested in a statistical *hypothesis test* (compare with alternative hypothesis). The null hypothesis is presumed to be true unless the test provides sufficient evidence to the contrary, in which case the *null hypothesis* is rejected and the alternative hypothesis (H_1) is accepted.

***performance evaluation (PE) program*:** A laboratory's participation in an internal or external program of analyzing proficiency-testing samples appropriate for the analytes and matrices under consideration (i.e., PE program traceable to a national standards body, such as NIST). Reference-material samples used to evaluate the performance of the laboratory are called performance-evaluation or proficiency-testing samples or materials. See *certified reference material.*

***precision*:** The closeness of agreement between independent test results obtained by applying the experimental procedure under stipulated conditions. Precision may be expressed as the standard deviation. Conversely, imprecision is the variation of the results in a set of replicate measurements.

protective action guide (PAG): The radiation dose to individuals in the general population that warrants protective action following a radiological event. In this document, PAGs limit the projected radiation doses for different exposure periods: not to exceed 2-rem *total effective dose equivalent (TEDE)* during the first year, 500-mrem TEDE during the second year, or 5 rem over the next 50 years (including the first and second years of the incident). See *total derived water concentration* and *analytical action level.*

***quality assurance (QA)*:** An integrated system of management activities involving planning, implementation, assessment, reporting, and quality improvement to ensure that a process, item, or service is of the type and quality needed and expected. Quality assurance includes *quality control.*

***quality control (QC)*:** The overall system of technical activities that measures the attributes and performance of a process, item, or service against defined standards to verify that they meet the stated requirements established by the project; operational techniques and activities that are used to fulfill requirements for quality. This system of activities and checks is used to ensure that measurement systems are maintained within prescribed limits, providing protection against out-of-control conditions and ensuring that the results are of acceptable quality.

reference material: See *certified reference material.*

***rem*:** The common unit for the effective or equivalent dose of radiation received by a living organism, equal to the actual dose (in rads) multiplied by a factor representing the danger of the radiation. Rem is an abbreviation for "roentgen equivalent man," meaning that it measures the biological effects of ionizing radiation in humans. One rem is equal to 0.01 Sv. See *sievert* and *dose equivalent.*

relative required method uncertainty **(n_{MR}):** The *required method uncertainty* divided by the *analytical action level.* The relative required method uncertainty is applied to radionuclide concentrations above the *analytical action level.* A key *measurement quality objective.*

required method uncertainty **(u_{MR}):** *Method uncertainty* at a specified concentration. A key *measurement quality objective.* See also *relative required method uncertainty.*

roentgen (R): A unit of exposure to ionizing radiation. It is that amount of gamma rays or X-rays required to produce ions carrying one electrostatic unit of electrical charge in one cubic centimeter of dry air under standard conditions. The unit of exposure rate is roentgens per hour (R/h). For environmental exposures, the typical units are microroentgens per hour (: R/h), or 10^{-6} R/h. In SI units, 1 R = 2.58×10^{-4} C/kg (coulombs per kilogram).

***sample*:** (1) A portion of material selected from a larger quantity of material. (2) A set of individual samples or measurements drawn from a population whose properties are studied to gain information about the entire population.

***screening method*:** An economical gross measurement (alpha, beta, gamma) used in a tiered approach to method selection that can be applied to *analyte* concentrations below an *analyte* level in the *analytical protocol specifications* or below a fraction of the specified *action level.*

***sievert (Sv)*:** The SI unit for the effective dose of radiation received by a living organism. It is the actual dose received (*grays* in SI or rads in traditional units) times a factor that is larger for more dangerous forms of radiation. One Sv is 100 *rem*. Radiation doses are often measured in mSv. An effective dose of 1 Sv requires 1 gray of beta or gamma radiation, but only 0.05 Gy of alpha radiation or 0.1 Gy of neutron radiation.

***source, radioactive*:** A quantity of material configured for radiation measurement.

***source term radionuclide*:** A radionuclide that is a significant contaminant in an environmental sample and results in dose contributions that will be important in decisionmaking.

sum of fractions: A calculated value to determine whether the summed contributions to dose by all radionuclides in a sample, divided by their respective dose limits, exceeds 1.0. For purposes of this calculation, the actual *analytical action level* (*derived water concentration* or *protective action guide*) is used rather than an *analytical decision level.*

***swipes*:** A filter pad used to determine the level of general radioactive contamination when it is wiped over a specific area, about 100 cm^2 in area. Also called smears or wipes.

***target analyte*:** A radionuclide on the list of radionuclides of interest or a radionuclide of concern for a project.

***total effective dose equivalent*:** The sum of the effective dose equivalent (for external exposure) and the committed effective dose equivalent (for internal exposure), expressed in units of Sv or rem. See *dose equivalent.*

Type I decision error**:** In a hypothesis test, the error made by rejecting the null hypothesis when it is true. A Type I decision error is sometimes called a "false rejection" or a "false positive."

Type II decision error**:** In a hypothesis test, the error made by failing to reject the null hypothesis when it is false. A Type II decision error is sometimes called a "false acceptance" or a "false negative."

uncertainty**:** A parameter, associated with the result of a measurement, that characterizes the dispersion of the values that could reasonably be attributed to the measurand. See *method uncertainty.*

To: Christ, Lisa[Christ.Lisa@epa.gov]; Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]; Ellis, Jerry[Ellis.Jerry@epa.gov]
From: DeCair, Sara
Sent: Wed 1/14/2015 10:11:04 PM
Subject: Last email, I promise! Updated briefing
Water PAG briefing for PAG Subcmte 1-14-2015 gray equals Sara speaking.docx
Water PAG briefing for PAG Subcmte 1-14-2015.docx

Here are a clean version of the briefing for next Thursday, and one with my part gray highlighted. See what you think about the division of talking points, since I kind of split it along topical and logical lines, based on what we did for the DA. Let me know if you need any changes, and I'll make them.

Thank you for all your hard work on this!

Sara

Sara D. DeCair

http://www.epa.gov/radiation/rert/pags.html

202-343-9108

new office

Room 1416 B in WJC West

To: Christ, Lisa[Christ.Lisa@epa.gov]; Veal, Lee[Veal.Lee@epa.gov]; Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]; Ellis, Jerry[Ellis.Jerry@epa.gov]
From: DeCair, Sara
Sent: Mon 1/12/2015 5:23:38 PM
Subject: Agenda for PAG Subcmte & briefing draft for them
Water PAG briefing for PAG Subcmte 1-12-2015.docx

All,

I've made some suggestions and deletions in the attached updated briefing that might work well to get the Subcmte up to speed on what we're proposing. Here is an agenda for the 90 minute call/webinar we have on Jan. 22:

- Introductions (name and agency)
- Run thru briefing on webinar, addressing comments and questions as we go
- Schedule and next steps is the last part of the briefing
- The sum of all PAGs under an imaginary constraint umbrella (I have a graphic I can show on webinar)
- Interaction with Food PAG & specifically the mention of drinking water as part of the diet in FDA guide
- Discuss choice of input assumptions and how we might use FRMAC methods for dose calculations
- Possibly using FRMAC methods for Sampling and Analysis

I know we'll wind up referring to our draft chapter and the group will be interested to get their hands on that. I am sure we'll be ready to share it for their review soon, and should set some realistic time goals for those reviews with our internal OGC/AA-ship and intra-office reviews in mind. This agenda will definitely take the full 90 minutes, and I'm confident it'll be a very productive discussion. Please let me know if you have suggestions for this agenda, or feedback on the briefing paper. Thanks!!

Sara

To: Christ, Lisa[Christ.Lisa@epa.gov]; Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]; Ellis, Jerry[Ellis.Jerry@epa.gov]; Veal, Lee[Veal.Lee@epa.gov]
Cc: Wieder, Jessica[Wieder.Jessica@epa.gov]; Telofski, Scott[telofski.scott@epa.gov]
From: DeCair, Sara
Sent: Fri 1/9/2015 9:12:58 PM
Subject: Better version: Redline edits to Water PAG chapter
ORIA cmts 1-8-2015 Draft Chapter Drinking Water PAG.docx

All,

This version of the draft Drinking Water PAG chapter, with comments that we discussed yesterday, incorporates improvements we talked about and has verified calculations. (Sorry I was too quick in sending a previous version to some of you, I should have known I would think of one more thing to do!)

Have a great weekend and I'll check in next week with an agenda for the PAGs Subcommittee meeting coming up,

Sara

Sara D. DeCair

http://www.epa.gov/radiation/rert/pags.html

202-343-9108

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Room 1416 B in WJC West

To: Christ, Lisa[Christ.Lisa@epa.gov]; Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]; Ellis, Jerry[Ellis.Jerry@epa.gov]; Veal, Lee[Veal.Lee@epa.gov]
From: DeCair, Sara
Sent: Fri 1/9/2015 8:19:58 PM
Subject: Improved redline of Water chapter
ORIA cmts 1-8-2015 Draft Chapter Drinking Water PAG.docx

All;

I've cleaned up the comments we discussed yesterday on the Drinking Water PAG chapter, and have checked all calculations. We are very close to a product we can share with our partners!

Next up, I will work on an agenda for the PAGs Subcommittee meeting and get that to you next week. Have a great weekend!

Sara

Sara D. DeCair

http://www.epa.gov/radiation/rert/pags.html

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Room 1416 B in WJC West

To: Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]; Ellis, Jerry[Ellis.Jerry@epa.gov]; Christ, Lisa[Christ.Lisa@epa.gov]
Cc: Veal, Lee[Veal.Lee@epa.gov]; Telofski, Scott[telofski.scott@epa.gov]; Wieder, Jessica[Wieder.Jessica@epa.gov]
From: DeCair, Sara
Sent: Tue 1/6/2015 9:18:21 PM
Subject: Water PAG chapter comments & FRMAC methods that might be handy
ORIA cmts 1-6-2015 Draft Chapter Drinking Water PAG.docx

Sam, Jerry, Lisa,

I'm still working on checking the DRLs math, but since we have time at 11:15 am tomorrow to talk, I thought I would send this rough markup back your way. The chapter is really looking good and Jessica, Lee, Scott and I felt free to make some wording tweaks and ask some bigger questions about scope and how this links up with the larger rad response community, versus meeting the needs of water suppliers who may be completely new to the PAGs thing.

Ex. 5 - Deliberative Process

http://www.nv.doe.gov/library/publications/frmac/FRMAC%20Division/FRMAC%20Monitoring%20and%20S

Ex. 5 - Deliberative Process

Talk to you tomorrow,

Sara D. DeCair

http://www.epa.gov/radiation/rert/pags.html

202-343-9108

new office

Room 1416 B in WJC West

To: Christ, Lisa[Christ.Lisa@epa.gov]
Cc: Burneson, Eric[Burneson.Eric@epa.gov]; Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]; Wieder, Jessica[Wieder.Jessica@epa.gov]; Veal, Lee[Veal.Lee@epa.gov]
From: DeCair, Sara
Sent: Mon 12/22/2014 2:35:10 PM
Subject: Re: PAGS article FYI

The issue is often recycled. Thanks for pointing it out!

Sent from my iPhone

On Dec 22, 2014, at 8:24 AM, "Christ, Lisa" <Christ.Lisa@epa.gov> wrote:

The timing of this article seems odd.

From: Burneson, Eric
Sent: Friday, December 19, 2014 12:27 PM
To: Christ, Lisa; DeCair, Sara; Hernandez-Quinones, Samuel
Subject: PAGS article FYI

http://www.globalresearch.ca/obama-increases-allowable-levels-of-radiation-in-drinking-water-dramatically/5420787

Eric Burneson, P.E.

Director of Standards and Risk Management

Office of Ground Water and Drinking Water

US Environmental Protection Agency

Phone: 202-564-5250

Fax: 202 564 3760

To: Christ, Lisa[Christ.Lisa@epa.gov]; Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]; Ellis, Jerry[Ellis.Jerry@epa.gov]
From: DeCair, Sara
Sent: Tue 12/16/2014 6:56:49 PM
Subject: Vote: January date/time for PAGs Subcmte

Please click on the link below to share your availability for the next meeting of the PAGs Subcommittee. We'll meet via phone and webinar, and will discuss a proposed approach for drinking water that I think you'll find interesting. Thanks for letting me know if you have questions or concerns, and happy holidays!

http://doodle.com/zi4hhuqbtt4m3vss

Sara D. DeCair

http://www.epa.gov/radiation/rert/pags.html

202-343-9108

new office

Room 1416 B in WJC West

To: Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]
Cc: Christ, Lisa[Christ.Lisa@epa.gov]
From: Burneson, Eric
Sent: Thur 12/11/2014 11:01:43 PM
Subject: RE: Draft Water PAG Chapter
12-10-14 Draft Chapter Drinking Water PAGegb.docx

Attached please find my edits and comments on the draft PAG chapter.

From: Hernandez-Quinones, Samuel
Sent: Wednesday, December 10, 2014 4:58 PM
To: Burneson, Eric
Cc: Christ, Lisa
Subject: Draft Water PAG Chapter

Hi Eric,

Attached for you review is the draft version of the Drinking Water PAG Chapter. I am still working on a few minor items that will be added at a later time, but the main components of the PAG write-up are described here.

Let me know your thoughts on this.

Thank You

Sam

==

Samuel Hernández Quiñones, P.E.
Environmental Engineer
Environmental Protection Agency
Office of Water
1200 Pennsylvania Ave. NW
Washington, DC 20460
202-564-1735

"USEPA Protecting Human Health and the Environment"

To: Christ, Lisa[Christ.Lisa@epa.gov]
Cc: DeCair, Sara[DeCair.Sara@epa.gov]; Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]
From: Veal, Lee
Sent: Mon 12/8/2014 6:15:16 PM
Subject: RE: Water PAG Chapter revisions

Good morning Lisa,

Thank you, this is helpful.

I'm going to ask Sara to start setting up the January interagency steering committee meeting. She will send a doodle poll to identify when people can make it.

Lee

Lee Ann B. Veal

Director, Center for Radiological Emergency Management

Radiation Protection Division, ORIA, OAR

Office: 202-343-9448

Cell: 202-617-4322

www.epa.gov/radiation

From: Christ, Lisa

Sent: Thursday, December 04, 2014 2:58 PM
To: Veal, Lee
Cc: DeCair, Sara; Hernandez-Quinones, Samuel
Subject: RE: Water PAG Chapter revisions

Hi Lee,

Sam, Jerry and I met earlier this week (last week was too difficult with the holiday). Sam's incorporating our comments which are mostly organization vs. content. We plan to have a draft ready for Eric to review NLT 12/10. After we've addressed his comments I think we will be comfortable going to the multi-agency committee with chapter language. I think this will keep us on track to meet with the multi-agency group in January and the rest of our milestones. It may be helpful to have the technical writer go back through the chapter after OGC and OW AA review.

Let me know if y'all have a different plan in mind.

Thanks-

Lisa

From: Veal, Lee
Sent: Thursday, December 04, 2014 1:42 PM
To: Christ, Lisa
Cc: DeCair, Sara; Hernandez-Quinones, Samuel
Subject: Water PAG Chapter revisions

Good afternoon Lisa,

I am in between meetings today and thought that I should catch up with you on the Water PAG chapter.

I recall that you have some recommendations on the chapter, particularly around the ordering of the information but also perhaps on making sure we have it down clearly. I have some thoughts as well.

What might be the most helpful thing we could do? I can make arrangements for our technical writer to sit with us and hear about our needs, then he can take a stab at the revision? Or other approach?

Lee

Lee Ann B. Veal

Director, Center for Radiological Emergency Management

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From: DeCair, Sara
Sent: Thursday, November 13, 2014 4:46 PM
To: Christ, Lisa; Perrin, Alan; Veal, Lee; Edwards, Jonathan; Hernandez-Quinones, Samuel
Subject: Materials for DA briefing on Water PAG

For our joint briefing with Deputy Administrator Stan Meiburg next Thursday, here are the updated materials. PAGs 101 has only one edit. It is a simpler definition of PAG on slide 3, at Mike Flynn's request. The only changes in the joint briefing are the footer date and the end date of the schedule (now March 2016) which I had mistyped previously.

The plan for the briefing is for me to offer to go through the PAGs 101 if Stan would like, and then Lisa and I are going to tag-team the briefing paper. We decided on which sections each of us will do this afternoon. A 'Background for DA' is attached from OW, on the details of how the risk analysis was done. Ken suggested this be provided for a read-ahead, but not to go through during the meeting.

Jon and Alan will send these up through Mike Flynn and Lisa will send materials up to Ken's office in the morning before they go to the DA's office. I will bring extra paper copies to the meeting. Cheers,

Sara

Sara D. DeCair

http://www.epa.gov/radiation/rert/pags.html

202-343-9108

new office

Room 1416 B in WJC West

To: Christ, Lisa[Christ.Lisa@epa.gov]
From: Hernandez-Quinones, Samuel
Sent: Thur 12/4/2014 9:26:14 PM
Subject: File Attached
12-4-14 Draft Chapter Drinking Water PAG clean.docx

Hi Lisa,

The most recent version of the file is attached.

Sam

==

Samuel Hernández Quiñones, P.E.
Environmental Engineer
Environmental Protection Agency
Office of Water
1200 Pennsylvania Ave. NW
Washington, DC 20460
202-564-1735

"USEPA Protecting Human Health and the Environment"

To: Christ, Lisa[Christ.Lisa@epa.gov]; Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]
From: Ellis, Jerry
Sent: Mon 12/1/2014 7:53:23 PM
Subject: Draft PAG Drinking Water Chapter
Draft Chapter Drinking Water PAG 10-28-2014 (JLE edits_comments Dec 1st).docx

Hi Sam and Lisa,

I reviewed the PAG chapter. Here are my edits and comments. Please take a look.

Thanks.

Jerry L. Ellis, Jr.

Environmental Scientist

U.S. Environmental Protection Agency

Standards and Risk Management Division

Office of Ground Water and Drinking Water

1200 Pennsylvania Ave. (4607M), N.W.

Washington, D.C. 20460

Phone: 202-564-2766

To: Christ, Lisa[Christ.Lisa@epa.gov]
From: Greene, Ashley
Sent: Wed 11/19/2014 10:06:06 PM
Subject: RE: Deputy Administrator Meeting on 11/20 Radiation PAG

Thanks Lisa!

From: Christ, Lisa
Sent: Wednesday, November 19, 2014 4:16 PM
To: Greene, Ashley
Subject: FW: Deputy Administrator Meeting on 11/20 Radiation PAG

Hi Ashley,

Here are the materials for Peter for tomorrow.

Lisa

From: Christ, Lisa
Sent: Friday, November 14, 2014 1:01 PM
To: Mason, Paula
Cc: Lopez-Carbo, Maria; Greene, Ashley; Hernandez-Quinones, Samuel; Burneson, Eric; Penman, Crystal
Subject: Deputy Administrator Meeting on 11/20 Radiation PAG

Hi Paula,

OAR has already requested and scheduled a briefing for Stan Meiburg for 11/20 (see attached). I'm providing the briefing materials for Ken's review 4 business days in advance per the new guidance.

Also attached are:

The pre-brief memo

The briefing document

Background materials: PAGs 101 & Background for Deputy Administrator

The OGWDW point of contact is Sam Hernandez. 564-1735

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Lisa Christ, Chief

Targeting and Analysis Branch

Office of Ground Water and Drinking Water

USEPA

1200 Pennsylvania Ave NW
Washington, DC 20460-0001
phone: 202.564.8354
fax: 202.564-3760

Mail Code: 4607M
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

To: Perrin, Alan[Perrin.Alan@epa.gov]; Veal, Lee[Veal.Lee@epa.gov]; Edwards, Jonathan[Edwards.Jonathan@epa.gov]; Christ, Lisa[Christ.Lisa@epa.gov]; Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]
From: DeCair, Sara
Sent: Fri 11/14/2014 2:53:31 PM
Subject: Updated clean version of materials for DA briefing
OW-OAR PAG brief final v2_LC.docx
Background for Deputy Administrator 11_20_14.docx
PAGs 101 11-4-2014.ppt

Thanks to Lisa for making a few edits to the briefing. Here are all three things to send up for the DA briefing next Thursday.

S.

Sara D. DeCair

http://www.epa.gov/radiation/rert/pags.html

202-343-9108

new office

Room 1416 B in WJC West

To: Christ, Lisa[Christ.Lisa@epa.gov]
From: DeCair, Sara
Sent: Thur 11/13/2014 10:18:17 PM
Subject: edited draft Water PAG chapter for your review
Draft Chapter Drinking Water PAG 10-28-2014.docx

Lisa,

I left a few of the comments in for your consideration. If you let me know when you'll be done with this round of review, I can update my PAGs project plan accordingly. Thanks so much!

Sara

Sara D. DeCair

http://www.epa.gov/radiation/rert/pags.html

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new office

Room 1416 B in WJC West

To: Christ, Lisa[Christ.Lisa@epa.gov]
From: DeCair, Sara
Sent: Thur 11/13/2014 9:57:20 PM
Subject: This briefing has your part highlighted
OW-OAR PAG brief final highlighted Lisa part.docx

To make sure I stop and start at the right points – see if I got it correct, and thanks for tag-teaming this with me!

Sara D. DeCair

http://www.epa.gov/radiation/rert/pags.html

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new office

Room 1416 B in WJC West

To: Christ, Lisa[Christ.Lisa@epa.gov]; Ellis, Jerry[Ellis.Jerry@epa.gov]
From: Hernandez-Quinones, Samuel
Sent: Mon 11/3/2014 2:44:18 PM
Subject: Re: Material for 11/4 and 11/5 PAG briefings

Ok,

I will bring the materials (hard copies) tomorrow to Ken's Scheduler.

Sam

==

Samuel Hernández Quiñones, P.E.
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202-564-1735

"USEPA Protecting Human Health and the Environment"

From: Christ, Lisa
Sent: Monday, November 3, 2014 9:34 AM
To: Ellis, Jerry; Hernandez-Quinones, Samuel
Subject: FW: Material for 11/4 and 11/5 PAG briefings

Hi Guys,

We need to send the materials to Ken according to the attached protocol. I sent a read ahead on the radionuclides rule to OARIA that may be a helpful reminder for Ken.

Thanks –

Lisa

From: Perrin, Alan
Sent: Friday, October 31, 2014 5:51 PM
To: OAR Briefings
Cc: Flynn, Mike; Burneson, Eric; Edwards, Jonathan; DeCair, Sara; Christ, Lisa; Veal,

Lee; Cherepy, Andrea
Subject: Material for 11/4 and 11/5 PAG briefings

The attached material is for:

1) our internal DW PAG pre-brief with Janet McCabe (11/4 at 12:30 pm), and

2) the Janet McCabe/Ken Kopocis OW-OAR DW PAG briefing (12/5 at 4:30 pm).

Note that the attached "PAGs 101" file is a very short primer for background reading; the "OW-OAR PAG-brief" file will be the focus at the meetings. Please let me know if you have any questions. –Alan

Alan Perrin, Deputy Director
Radiation Protection Division, USEPA
ofc (202) 343-9775 | mbl (202) 279-0376

To: Christ, Lisa[Christ.Lisa@epa.gov]; Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]; Ellis, Jerry[Ellis.Jerry@epa.gov]
Cc: DeCair, Sara[DeCair.Sara@epa.gov]
From: Veal, Lee
Sent: Thur 10/30/2014 7:55:03 PM
Subject: RE: Cmt by Wed: Water PAG briefing and PAGs 101

Hi Lisa,

I cannot imagine sending any AA a package that isn't near perfect, but 10 weeks sounds pretty long.

We should talk about some of the added language. I propose that we get Mike Flynn's comments tomorrow (we're scheduled with him in the morning) and then assess both sets, deal with any conflicts and touch base again on Monday. Does that work for you guys?

Lee

Lee Ann B. Veal

Director, Center for Radiological Emergency Management

Radiation Protection Division, ORIA, OAR

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From: Christ, Lisa
Sent: Thursday, October 30, 2014 12:28 PM
To: Veal, Lee; Hernandez-Quinones, Samuel; Ellis, Jerry
Cc: DeCair, Sara
Subject: RE: Cmt by Wed: Water PAG briefing and PAGs 101

Hi Lee –

Ken has advised that he will very carefully review all actions of OW and his expectation is that it will be near perfect for his review. Here's our assumptions on OW internal review:

We will want OGC review before OW senior management review

2 weeks: Incorporate comments from Interagency steering committee and OGC

1 week: BC review (I can take less time if needed)

2 weeks: DD review

2 weeks: OD review

3 weeks: AA review

Total = 10 weeks. We may need less time to incorporate comments if they aren't substantial/significant/numerous; Eric and I could potential shorten our review time, but I believe Peter and Ken will want/need at least 2-3 weeks each. Happy to set up a time to chat.

Sorry I've been so hard to reach – I've been swamped with PARS…

Thanks-

Lisa

From: Veal, Lee

Sent: Thursday, October 30, 2014 11:43 AM
To: Christ, Lisa; Hernandez-Quinones, Samuel; Ellis, Jerry
Cc: DeCair, Sara
Subject: RE: Cmt by Wed: Water PAG briefing and PAGs 101

Hi Lisa,

I just left a message with you.

I would like to better understand the schedule insert of going back to AAs in early 2015. Are you all thinking that we're going to have substantial changes from the PAGs Subcommittee? Or internally?

If you are thinking about the Subcommittee, we do not expect a lengthy interaction. The PAGs Subcommittee is very unlikely to debate on this issue given that it is water and water is well within our mission space. At most, you might get an editorial comment or, more likely, expressions of gratitude that we have made progress.

The OMB review will certainly get to the leadership structures within the interagency. It is at that point that we could have substantial changes suggested, within that roughly 90 day period.

Lee

Lee Ann B. Veal

Director, Center for Radiological Emergency Management

Radiation Protection Division, ORIA, OAR

Office: 202-343-9448

Cell: 202-617-4322

www.epa.gov/radiation

From: Christ, Lisa
Sent: Wednesday, October 29, 2014 5:17 PM
To: Veal, Lee; Hernandez-Quinones, Samuel; Ellis, Jerry
Cc: DeCair, Sara
Subject: RE: Cmt by Wed: Water PAG briefing and PAGs 101

Hi Lee,

The briefing with Ken yesterday went well. We got feedback from him on the briefing materials. I've attached our comments to Sara's draft based on his input. Let us know if you have questions or concerns or would like to chat to finalize the document..

Thanks!

Lisa

From: Veal, Lee
Sent: Wednesday, October 29, 2014 4:00 PM
To: Christ, Lisa; Hernandez-Quinones, Samuel; Ellis, Jerry
Cc: DeCair, Sara
Subject: RE: Cmt by Wed: Water PAG briefing and PAGs 101

Hi Lisa,

How did the pre-brief go? Any thoughts on how we might improve the content?

Lee

Lee Ann B. Veal

Director, Center for Radiological Emergency Management

Radiation Protection Division, ORIA, OAR

Office: 202-343-9448

Cell: 202-617-4322

www.epa.gov/radiation

From: Christ, Lisa
Sent: Monday, October 27, 2014 3:09 PM
To: DeCair, Sara; Hernandez-Quinones, Samuel; Ellis, Jerry; Veal, Lee; Perrin, Alan; Edwards, Jonathan
Subject: RE: Cmt by Wed: Water PAG briefing and PAGs 101

Hi Sara –

We're pre-briefing our AA tomorrow, so we can provide any feedback from Ken as well as our comments on your attachments Wednesday, we'll try our best for noon.

Thank you –

Lisa

From: DeCair, Sara
Sent: Monday, October 27, 2014 2:31 PM
To: Christ, Lisa; Hernandez-Quinones, Samuel; Ellis, Jerry; Veal, Lee; Perrin, Alan; Edwards, Jonathan
Subject: Cmt by Wed: Water PAG briefing and PAGs 101

Sam, Lisa,

Since our AA-level briefing was rescheduled to Wed., Nov. 5th, we have until this Wednesday to get our briefing materials finalized. Can you provide feedback to me by noon on Wednesday? I will have the Water PAG proposed chapter language to you by then, too. It is through editing and I will get it to you as soon as possible for a read-through. Thank you so much for getting back to me on these items!

Talk soon,

Sara

Sara D. DeCair

http://www.epa.gov/radiation/rert/pags.html

202-343-9108

new office

Room 1416 B in WJC West

To: Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]; Ellis, Jerry[Ellis.Jerry@epa.gov]; Christ, Lisa[Christ.Lisa@epa.gov]; Veal, Lee[Veal.Lee@epa.gov]; Perrin, Alan[Perrin.Alan@epa.gov]; Edwards, Jonathan[Edwards.Jonathan@epa.gov]; Nesky, Anthony[Nesky.Tony@epa.gov]
From: DeCair, Sara
Sent: Tue 10/28/2014 5:26:57 PM
Subject: New drinking water PAG chapter for your review
Draft Chapter Drinking Water PAG 10-28-2014.docx

All;

This has been through Tony's editing and Alan's review in our office and is ready for review by our colleagues in Water. I left a few of the comments in for your consideration. Please take your time to evaluate the order and content here, and if you would, provide feedback to me in the form of comments or redline/strikeout. If you let me know when you'll be done with this round of review, I can update my PAGs project plan accordingly. Thank you,

Sara

Sara D. DeCair

http://www.epa.gov/radiation/rert/pags.html

202-343-9108

new office

Room 1416 B in WJC West

To: Christ, Lisa[Christ.Lisa@epa.gov]; Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]; Ellis, Jerry[Ellis.Jerry@epa.gov]; Veal, Lee[Veal.Lee@epa.gov]; Perrin, Alan[Perrin.Alan@epa.gov]; Edwards, Jonathan[Edwards.Jonathan@epa.gov]
From: DeCair, Sara
Sent: Mon 10/27/2014 6:31:07 PM
Subject: Cmt by Wed: Water PAG briefing and PAGs 101
Joint AAs Briefing 10-16-2014_draft.docx
PAGs 101 10-17-2014.ppt

Sam, Lisa,

Since our AA-level briefing was rescheduled to Wed., Nov. 5th, we have until this Wednesday to get our briefing materials finalized. Can you provide feedback to me by noon on Wednesday? I will have the Water PAG proposed chapter language to you by then, too. It is through editing and I will get it to you as soon as possible for a read-through. Thank you so much for getting back to me on these items!

Talk soon,

Sara

Sara D. DeCair

http://www.epa.gov/radiation/rert/pags.html

202-343-9108

new office

Room 1416 B in WJC West

To: Christ, Lisa[Christ.Lisa@epa.gov]
From: Hernandez-Quinones, Samuel
Sent: Mon 10/27/2014 6:00:59 PM
Subject: Re: draft Rads PAG pre-brief for Ken K. - due at 3pm
V4 -KKopocis Pre-Brief Materials DW PAG egb.doc

Lisa,

This is the clean version ready for printing. I have removed all the comments and tracked-changes.

Let me know if you have any comments or edits on this.

Sam

==

Samuel Hernández Quiñones, P.E.
Environmental Engineer
Environmental Protection Agency
Office of Water
1200 Pennsylvania Ave. NW
Washington, DC 20460
202-564-1735

"USEPA Protecting Human Health and the Environment"

From: Christ, Lisa
Sent: Monday, October 27, 2014 1:33 PM
To: Hernandez-Quinones, Samuel
Subject: RE: draft Rads PAG pre-brief for Ken K. - due at 3pm

Hi Sam –

I need the revised briefing by 1:45pm. I have a 2pm meeting and I need to walk the hard copies upstairs before 3pm.

Thanks-

Lisa

From: Burneson, Eric
Sent: Monday, October 27, 2014 10:35 AM
To: Hernandez-Quinones, Samuel
Cc: Christ, Lisa; Christ, Lisa; Ellis, Jerry
Subject: RE: draft Rads PAG pre-brief for Ken K. - due at 3pm

My comments and suggested edits are attached.

From: Hernandez-Quinones, Samuel
Sent: Monday, October 27, 2014 9:41 AM
To: Burneson, Eric
Cc: Christ, Lisa; Christ, Lisa; Ellis, Jerry
Subject: Re: draft Rads PAG pre-brief for Ken K. - due at 3pm

This version has all formatting issues fixed.

Sam

==

Samuel Hernández Quiñones, P.E.
Environmental Engineer
Environmental Protection Agency
Office of Water
1200 Pennsylvania Ave. NW
Washington, DC 20460
202-564-1735

"USEPA Protecting Human Health and the Environment"

From: Christ, Lisa
Sent: Monday, October 27, 2014 9:10 AM
To: Burneson, Eric
Cc: Hernandez-Quinones, Samuel; Ellis, Jerry

Subject: draft Rads PAG pre-brief for Ken K. - due at 3pm

Hi Eric,

Sorry for the delay. The attached version has formatting issues, which we'll fix it while you're reviewing.

Thanks-

Lisa

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Lisa Christ, Chief

Targeting and Analysis Branch

Office of Ground Water and Drinking Water

USEPA

1200 Pennsylvania Ave NW
Washington, DC 20460-0001
phone: 202.564.8354
fax: 202.564-3760

Mail Code: 4607M
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

To: Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]; Lisa Christ[Christlm2@yahoo.com]; Christ, Lisa[Christ.Lisa@epa.gov]
From: Lisa Christ
Sent: Fri 10/24/2014 7:03:16 PM
Subject: Re: Fw: Materials for Kopocis Pre-Brief
Rads PAG.wps
Rads PAG.wps.rtf
Rads PAG.wps

I hope this works!!

Hi Lisa,

I am also attaching the
file compatible with older versions of Word.

Sam

Briefing Ken Kopocis
OW-Acting AA

Protective Action Guide (PAG) for Drinking Water

October 28, 2014

Purpose of this briefing:

Prepare for the Joint OW-OAR AA-level briefing on October 30Provide Background Information about PAG Development and SDWA Policy Implications
Provide basis and rationale that support the recommended Drinking Water PAG

Background on SDWA MCLs for Radionuclides:

In 1976 EPA issued interim regulations for Radionuclides in Drinking Water. In December 2000, EPA promulgated final regulations for four radionuclide groups:

Gross Alpha (Minus Radon & Uranium) MCL = 15 pCi/L –Retained from 1976 RuleCombined Radium 226 & 228, MCL = 5 pCi/L Retained from 1976 RuleGross Beta & Photon, MCL = 4 mrem/yr (Uses Dose Conversion Factors from 1976 Rule)Uranium MCL = 30 ug/L, Newly established standard

As a point of reference, for the Gross Beta & Photon, MCL = 4 mrem annual dose:

For Iodine-131 in drinking water the derived concentration corresponds to

3 pCi/L

Based on limiting the dose to the thyroid to 4 mrem/yrAssumes 70-year (lifetime) exposure through drinking waterUtilizes dose calculation methods developed in 1958 (ICRP 2)

Current science (ICRP 72) would calculate the 4 mrem effective dose to the whole body, not a specific organ

55 pCi/L for Children & 120 pCi/L for Adults for I-131

What is a Protective Action Guide (PAG)?

A PAG provides a projected dose value, at which specific protective action is recommended to avoid or reduce the potential radiation exposure that an individual might be exposed to as a result of an accidental or deliberative release of radioactive material.

A PAG provides guidance designed to assist Federal, State and local governments to avoid acute effects, reduce risk of chromic effects and optimize responses for flexibility and maximum benefit during radiological incidents.

EPA is responsible for issuing the PAG Manual with the collaboration of an interagency workgroup that includes: DHS, FEMA, DOE, NRC, HHS and others. OAR is EPA's Lead.

PAGs were initially published in 1992, but the drinking water component was not included citing "Protective action recommendations for drinking water are under development by EPA". EPA promised that a drinking water PAG would be developed in a future revision of the PAG document

Drinking
Water PAG Development timeline:

Protective Action
Guides in the 1992 Manual

Phase
Protective
Action
Protective Action
Guide

Intermediate
(weeks/months to 1 yr)

Relocation of
the public
2 rem projected
dose first year. Subsequent years, 0.5rem/y projected
dose

Food interdiction

0.5 rem/y
projected dose, or 5 rem/y to any individual organ or
tissue, whichever is limiting

Drinking
water interdiction
Promised

August
2008

DHS issued a planning guidance recommending that
protective actions for Drinking Water be implemented if

levels were projected to exceed 500 mrem for the first year.
DHS guidance was specifically developed for Radiological Dispersion Device (RDD) and Improvised Nuclear Device (IND) Incidents.

January
2009

There was an EPA effort to issue a Drinking Water PAG in early 2009, but the proposal was held-back by the incoming Administration. At the time it was suggested that the Drinking Water PAG would be 500 mrem/yr.
OW's position on this issue was that protective actions should be based on the SDWA MCL for Radionuclides (4 mrem/yr).

March 2011
Fukushima - Japan

Ex. 5 - Deliberative Process

Drinking Water Advisory issued by the Japanese Government during Fukushima for Iodine-131 was 100 Becquerel/liter for Infants and 300 Becquerel/liter for Adults (about 2700 pCi/L for Infants & 8000 pCi/L for Adults). ***SDWA MCL for I-131 is 3 pCi/L.

April
2013
Draft PAG Manual –
April 2013

EPA Stated:

“EPA is
not proposing a specific drinking water PAG at this time.
EPA has established enforceable drinking water standards for radionuclides under the Safe Drinking Water Act (SDWA). EPA recommends that, to the extent practicable,
emergency measures for drinking water be based on the National Primary Drinking Water Regulations (NPDWR) for Radionuclides. ……

However, in light the Fukushima nuclear power plant accident, in which some Japanese drinking water supplies were impacted, the Agency recognizes a short-term emergency drinking water guide may be useful for public health protection The Agency requests
input on the appropriateness of, and possible values for, a drinking water PAG.”

OGWDW
Approach for Developing a Drinking Water
PAG

Options considered
during PAG development:

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

Projected risks levels vary widely depending on Age, Exposure Time Frame, and Intake Rates. Projected Risks are informed on the most recent and widely accepted dosimetry and dose conversion factors.

Iodine-131

*SDWA Derived MCL Concentration 3 pCi/L

Dose (mrem)
4 mrem
75 mrem

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

Subpopulation of
Concern:

Based on the calculated projections, infants and children 5 years old and younger appear to have the greatest risk from exposure to radionuclides in drinking water.

A PAG developed to protect infants and children 5 years and younger would also be at least as protective to fetuses and developing embryos.

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

Samuel Hernández
Quiñones, P.E.

Environmental Engineer

Environmental Protection Agency

Office of Water

1200 Pennsylvania Ave. NW

Washington, DC 20460

202-564-1735
"USEPA
Protecting Human Health and the
Environment"

From: Christ, Lisa

Sent: Friday, October 24, 2014 12:53 PM

To: Hernandez-Quinones, Samuel

Subject: Re: Materials for Kopocis Pre-Brief

Hi sam

Can you resend but with editing enabled. I can't open the document to send my edits. Also can you save it as an older word version? Maybe version 7?

Ex. 6 - Personal Privacy

Thsnkd

Lisa

Sent from my BlackBerry 10 smartphone on the Verizon Wireless 4G LTE network.

From: Hernandez-Quinones, Samuel
Sent: Wednesday, October 22, 2014 3:22 PM
To: Christ, Lisa
Subject: Materials for Kopocis Pre-Brief

Hi Lisa,

Attached is the briefing
document for Kopocis Pre-Brief. It has a lot of
information but I think all this is needed to properly bring
him up to speed to the PAGs issue.

Let me know if you have
any comments.

Thank You
Sam
==

Samuel Hernández
Quiñones, P.E.

Environmental Engineer

Environmental Protection Agency

Office of Water

1200 Pennsylvania Ave. NW

Washington, DC 20460

202-564-1735

"USEPA Protecting
Human Health and the Environment"

To: DeCair, Sara[DeCair.Sara@epa.gov]
Cc: Christ, Lisa[Christ.Lisa@epa.gov]; Veal, Lee[Veal.Lee@epa.gov]; Perrin, Alan[Perrin.Alan@epa.gov]
From: Hernandez-Quinones, Samuel
Sent: Fri 10/17/2014 6:33:02 PM
Subject: Re: Need your conversion of Japan water levels

Hi Sara,

Ex. 5 - Deliberative Process

Sam

==

Samuel Hernández Quiñones, P.E.
Environmental Engineer
Environmental Protection Agency
Office of Water
1200 Pennsylvania Ave. NW
Washington, DC 20460
202-564-1735

"USEPA Protecting Human Health and the Environment"

From: DeCair, Sara
Sent: Friday, October 17, 2014 2:07 PM
To: Hernandez-Quinones, Samuel
Cc: Christ, Lisa; Veal, Lee; Perrin, Alan
Subject: Need your conversion of Japan water levels

Sam,

We talked briefly about the conversion you did c **Ex. 5 - Deliberative Process**

Ex. 5 - Deliberative Process

I need this detail straight for the edited version of the drinking water PAG chapter/FR proposal that I'm finishing up right now. Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

Sara

Sara D. DeCair

http://www.epa.gov/radiation/rert/pags.html

202-343-9108

new office

Room 1416 B in WJC West

To: Christ, Lisa[Christ.Lisa@epa.gov]; Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]
Cc: Veal, Lee[Veal.Lee@epa.gov]; Perrin, Alan[Perrin.Alan@epa.gov]; Edwards, Jonathan[Edwards.Jonathan@epa.gov]
From: DeCair, Sara
Sent: Fri 10/17/2014 5:08:43 PM
Subject: PAGs 101 for your review, intended as read-ahead for AA level briefing
PAGs 101 10-17-2014.ppt

Lisa, Sam,

We've added more content to this PAGs 101 briefing Ex. 5 - Deliberative Process Ex. 5 - Deliberative Process so that we can add more details or explanation where needed. Knowing that we are going to provide this as a read-ahead, rather than necessarily get to go through it in the Oct. 30 meeting, it does need to stand alone. But -- we could consider running through this first to lay the ground work, and then go to our drinking water PAG briefing document. Ex. 5 - Deliberative Process

Interested in thoughts from everyone on this, so we can get it finalized to send up as read-aheads by Friday, Oct. 24th. Thanks so much!

Sara

Sara D. DeCair

http://www.epa.gov/radiation/rert/pags.html

202-343-9108

new office

Room 1416 B in WJC West

To: Christ, Lisa[Christ.Lisa@epa.gov]; Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]; Ellis, Jerry[Ellis.Jerry@epa.gov]
Cc: Veal, Lee[Veal.Lee@epa.gov]; Perrin, Alan[Perrin.Alan@epa.gov]; Edwards, Jonathan[Edwards.Jonathan@epa.gov]
From: DeCair, Sara
Sent: Thur 10/16/2014 9:08:26 PM
Subject: draft water PAG briefing for AAs
Joint AAs Briefing 10-16-2014_draft.docx

Lisa and Sam, for your review and input. I wonder if the order of some of the Rationale bullets could flow better. I did the edits in Track Changes, but it's a lot easier to read with No Markup! Let me know how we should finalize this, so we can provide read-aheads by Friday, Oct. 24th.

Next up, I'll send you my latest PAGs 101 briefing. Thanks so much,

Sara

Sara D. DeCair

http://www.epa.gov/radiation/rert/pags.html

202-343-9108

new office

Room 1416 B in WJC West

To: Burneson, Eric[Burneson.Eric@epa.gov]; Christ, Lisa[Christ.Lisa@epa.gov]; Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]
Cc: Edwards, Jonathan[Edwards.Jonathan@epa.gov]; Veal, Lee[Veal.Lee@epa.gov]; DeCair, Sara[DeCair.Sara@epa.gov]
From: Perrin, Alan
Sent: Fri 10/10/2014 7:16:06 PM
Subject: FW: PAGs briefing material
Joint ODs Briefing 10-9-2014_final.docx

Colleagues,

Here is the material that's been forwarded to Mike Flynn for Tuesday's DW PAG briefing. Please distribute through your management chain as appropriate. Ms. DeCair has volunteered to bring hard-copies to the meeting on Tuesday. I hope you all have a great weekend. -Alan

~~~~~~~~~~~~

Alan Perrin, Deputy Director
Radiation Protection Division, USEPA
ofc (202) 343-9775 | mbl (202) 279-0376

From: Perrin, Alan
Sent: Friday, October 10, 2014 3:00 PM
To: Flynn, Mike; Cherepy, Andrea
Cc: Edwards, Jonathan
Subject: PAGs briefing material

Mike, here is read ahead material for Tuesday's 11:15 am OGWDW/ORIA PAGs briefing. -Alan

~~~~~~~~~~~~

Alan Perrin, Deputy Director
Radiation Protection Division, USEPA
ofc (202) 343-9775 | mbl (202) 279-0376

To: Lopez-Carbo, Maria[Lopez-Carbo.Maria@epa.gov]
Cc: Christ, Lisa[Christ.Lisa@epa.gov]; Burneson, Eric[Burneson.Eric@epa.gov]; Ellis, Jerry[Ellis.Jerry@epa.gov]
From: Hernandez-Quinones, Samuel
Sent: Fri 10/10/2014 6:30:43 PM
Subject: Briefing Documents
Joint ODs Briefing 10-10-2014.docx

Hi Maria,

attached is the briefing document for Tuesday's meeting.

Thank You

Sam

==

Samuel Hernández Quiñones, P.E.
Environmental Engineer
Environmental Protection Agency
Office of Water
1200 Pennsylvania Ave. NW
Washington, DC 20460
202-564-1735

"USEPA Protecting Human Health and the Environment"

To: Christ, Lisa[Christ.Lisa@epa.gov]
From: Hernandez-Quinones, Samuel
Sent: Tue 10/7/2014 8:42:24 PM
Subject: Edits to Briefing Document
SamH Edits 10-7-14 - Joint ODs Briefing.docx

Hi Lisa,

Here are my edits. I ended up incorporating more edits that I initially though we needed but please let me know what you think about this. I left the pros/cons part out because it ties back to the rationale section and I think is better if we talk about this items during the discussion.

I will send you the other part of the briefing document (DW Basis/Assumptions) as soon as I am done editing them. This one took me longer than expected.

Thank You

Sam

==

Samuel Hernández Quiñones, P.E.
Environmental Engineer
Environmental Protection Agency
Office of Water
1200 Pennsylvania Ave. NW
Washington, DC 20460
202-564-1735

"USEPA Protecting Human Health and the Environment"

To: Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]; Christ, Lisa[Christ.Lisa@epa.gov]; Veal, Lee[Veal.Lee@epa.gov]; Perrin, Alan[Perrin.Alan@epa.gov]
From: DeCair, Sara
Sent: Mon 10/6/2014 3:25:01 PM
Subject: Water briefing: new version for your input
Joint Briefing 10-6-2014.docx

Sam, Lisa,

Our briefing with ODs is in a week and we'll want to provide the read-ahead materials no later than Friday morning. Do you want to sit down Tuesday or Wednesday to go over the PAG 101 material together? Please provide your input on this briefing by COB Thursday, if you would, and of course, call or email anytime if you need me. Thank you!

Sara

To: Christ, Lisa[Christ.Lisa@epa.gov]
From: Hernandez-Quinones, Samuel
Sent: Thur 9/25/2014 6:57:15 PM
Subject: Meeting Purpose Write-up

Hi Lisa,

This is what I was planning to include in the request form. Let me know if you have any edits.

Thanks

Sam

Purpose of the meeting is to provide background information about the development of Radiation Protective Action Guides for Drinking Water. This meeting is in preparation for a Joint Meeting Mr. Kopocis will have with the AA from the office of Air on October 30th. We want to make sure Mr. Kopocis is fully aware of how the staff developed the recommendations that will be presented during the Joint AAs Briefing.

==

Samuel Hernández Quiñones, P.E.
Environmental Engineer
Environmental Protection Agency
Office of Water
1200 Pennsylvania Ave. NW
Washington, DC 20460
202-564-1735

"USEPA Protecting Human Health and the Environment"

To: Veal, Lee[Veal.Lee@epa.gov]; Christ, Lisa[Christ.Lisa@epa.gov]; Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]; Ellis, Jerry[Ellis.Jerry@epa.gov]; Edwards, Jonathan[Edwards.Jonathan@epa.gov]; Perrin, Alan[Perrin.Alan@epa.gov]; Gillam, Connie[Gillam.Connie@epa.gov]; Burneson, Eric[Burneson.Eric@epa.gov]
From: DeCair, Sara
Sent: Wed 9/24/2014 10:34:12 PM
Subject: Material for Thurs. 3:30 pm Water PAG briefing
Joint Briefing Edwards-Burneson 9-25-2014.docx

All;

For tomorrow's 3:30 pm briefing on the water PAG, please refer to the attached briefing document. We'll also bring printed copies for our discussion. See you then,

Sara

cell 202-738-2871

To: DeCair, Sara[DeCair.Sara@epa.gov]; Christ, Lisa[Christ.Lisa@epa.gov]; Veal, Lee[Veal.Lee@epa.gov]
From: Hernandez-Quinones, Samuel
Sent: Wed 9/24/2014 9:25:38 PM
Subject: RE: For 11 am I will call your office
Sam Edits - Joint Briefing Edwards-Burneson.docx

Hi Sara,

Attached are my few edits.

Also, I talked with Lisa and I think we need to remove that additional bullet. Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

I will think about this item tonight and I will let you know if there is anything we can add. But I think this is a good issue to bring up tomorrow so that we have clear guidance on how to convey this information.

Sam

From: DeCair, Sara
Sent: Wednesday, September 24, 2014 4:56 PM
To: Christ, Lisa; Hernandez-Quinones, Samuel; Veal, Lee
Subject: Re: For 11 am I will call your office

These are all incorporated and good catch on my accidentally moving the big briefing so much closer!

I'll wait another 45 minutes or so then send up. Shall I send to Eric as well or would you rather? Thanks!

From: Christ, Lisa
Sent: Wednesday, September 24, 2014 4:28 PM
To: DeCair, Sara; Hernandez-Quinones, Samuel; Veal, Lee
Subject: RE: For 11 am I will call your office

Last few edits –

From: DeCair, Sara
Sent: Wednesday, September 24, 2014 4:06 PM
To: Hernandez-Quinones, Samuel; Christ, Lisa; Veal, Lee
Subject: Re: For 11 am I will call your office

Please take a look and see if the yellow highlight is better, or worse, than the second bullet on Rationale. I thought I would take a stab at it!

I propose talking through this briefing myself fairly quickly and linearly, and then ask Sam and Lisa to add key perspectives. Of course questions and discussion will pop up throughout.

I can send the final up to Jon and Alan at 5:30 pm but will wait til then to get your feedback. Thank you!!

Sara

cell 202-738-2871

From: Hernandez-Quinones, Samuel

Sent: Wednesday, September 24, 2014 2:40 PM
To: Christ, Lisa; DeCair, Sara; Veal, Lee
Subject: RE: For 11 am I will call your office

Hi,

Attached is the revised file.

Please let me know if you have any comments.

Thank You

Sam

==

Samuel Hernández Quiñones, P.E.
Environmental Engineer
Environmental Protection Agency
Office of Water
1200 Pennsylvania Ave. NW
Washington, DC 20460
202-564-1735

"USEPA Protecting Human Health and the Environment"

From: Christ, Lisa
Sent: Wednesday, September 24, 2014 9:16 AM
To: DeCair, Sara; Veal, Lee; Hernandez-Quinones, Samuel; Ellis, Jerry
Subject: RE: For 11 am I will call your office

Sara –

How about if we call you? I have a polycom we can use which will work better than the phone.

Lisa

From: DeCair, Sara
Sent: Wednesday, September 24, 2014 9:05 AM
To: Christ, Lisa; Veal, Lee; Hernandez-Quinones, Samuel; Ellis, Jerry
Subject: For 11 am I will call your office

Lisa,

Thanks for setting this up. If it's just me offsite today, I will call your desk at 564-8354.
We could use my bridge if anyone else is offsite.

Sara

cell 202-738-2871

To: Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]; Christ, Lisa[Christ.Lisa@epa.gov]
Cc: Veal, Lee[Veal.Lee@epa.gov]
From: DeCair, Sara
Sent: Tue 9/23/2014 9:42:11 PM
Subject: DDs briefing, a bit shorter
PAG for Water one pager 9-23-2014.docx

Sam, Lisa,

I was working on this one-pager when Sam sent his over, and I think we cover the same things. Serendipity! If you are able to get back to us tomorrow, we can provide the briefing to Jon and Eric in advance of the Thursday afternoon briefing. I am quite sure that I can talk through the few things that are not specifically written in here, during the discussion.

Thanks so much for sending me any suggestions you have by about 4 pm tomorrow, Wednesday. Talk to you soon!

Sara

Sara D. DeCair

http://www.epa.gov/radiation/rert/pags.html

202-343-9108

new office

Room 1416 B in WJC West

To: Christ, Lisa[Christ.Lisa@epa.gov]
From: Hernandez-Quinones, Samuel
Sent: Mon 8/25/2014 9:45:36 PM
Subject: RE: a couple things
Office of Air input.docx

Lisa this is the language provided by the Office of Air.

Sam

==

Samuel Hernández Quiñones, P.E.
Environmental Engineer
Environmental Protection Agency
Office of Water
1200 Pennsylvania Ave. NW
Washington, DC 20460
202-564-1735

"USEPA Protecting Human Health and the Environment"

From: Christ, Lisa
Sent: Monday, August 25, 2014 11:10 AM
To: Hernandez-Quinones, Samuel
Subject: a couple things

Hi Sam,

I received a voicemail from Lee today asking to touch base on the Rads PAG stuff, so I scheduled a meeting for tomorrow. Please send me the latest language from ORIA.

Ex. 5 - Deliberative Process

Let me know if you have any questions or concerns –

Lisa

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Lisa Christ, Chief

Targeting and Analysis Branch

Office of Ground Water and Drinking Water

USEPA

1200 Pennsylvania Ave NW
Washington, DC 20460-0001
phone: 202.564.8354
fax: 202.564-3760

Mail Code: 4607M
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

To: Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]; DeCair, Sara[DeCair.Sara@epa.gov]; Christ, Lisa[Christ.Lisa@epa.gov]
From: Veal, Lee
Sent: Tue 8/5/2014 4:02:49 PM
Subject: RE: H2O language; question on

Thank you very much Sam.

Lee Ann B. Veal

Director, Center for Radiological Emergency Management

Radiation Protection Division, ORIA, OAR

Office: 202-343-9448

Ex. 6 - Personal Privacy

www.epa.gov/radiation

From: Hernandez-Quinones, Samuel
Sent: Tuesday, August 05, 2014 11:04 AM
To: Veal, Lee; DeCair, Sara; Christ, Lisa
Subject: RE: H2O language; question on

Ok,

I will cancel the room I had for Thursday's Meeting.

I will also send Sara the latest version of the Briefing Materials I am working on, so we can work out the details.

Thank you

Sam

==

Samuel Hernández Quiñones, P.E.
Environmental Engineer
Environmental Protection Agency
Office of Water
1200 Pennsylvania Ave. NW
Washington, DC 20460
202-564-1735

"USEPA Protecting Human Health and the Environment"

From: Veal, Lee
Sent: Tuesday, August 05, 2014 9:35 AM
To: DeCair, Sara; Hernandez-Quinones, Samuel; Christ, Lisa
Subject: RE: H2O language; question on

Sara and Sam,

I am thinking that it would be prudent to do more work at our level on the water PAG basis before trying to brief our DDs. I don't think that we're quite ready to do that.

Also, given Nancy's departure, we know that AA brief endpoint will be delayed as well

Sara will be back in the office on Thursday. Given that her office is still in boxes, I'll suggest that we try to talk on Monday or Tuesday next week.

In the meantime, I'll send a note to the schedulers to postpone.

Lee

Lee Ann B. Veal

Director, Center for Radiological Emergency Management

Radiation Protection Division, ORIA, OAR

Office: 202-343-9448

Ex. 6 - Personal Privacy

www.epa.gov/radiation

From: DeCair, Sara
Sent: Monday, August 04, 2014 10:39 AM
To: Hernandez-Quinones, Samuel
Cc: Veal, Lee
Subject: Re: H2O language; question on

For Thursday's 1 pm discussion with DDs, can you set aside a room, Sam? I think your draft language can serve as briefing material so we can get direction, and be ahead of the shifting AA briefing process.

Thanks!!

Sent from my iPhone

On Jul 31, 2014, at 4:23 PM, "Hernandez-Quinones, Samuel" <Hernandez.Samuel@epa.gov> wrote:

Hello,

Ex. 5 - Deliberative Process

Since we still do not know how the transition in the AA will take place, we will have to wait some time to have a better idea of how we should proceed.

I will let you know when we have additional information.

Sam

==

Samuel Hernández Quiñones, P.E.
Environmental Engineer
Environmental Protection Agency
Office of Water
1200 Pennsylvania Ave. NW
Washington, DC 20460
202-564-1735

"USEPA Protecting Human Health and the Environment"

From: Veal, Lee
Sent: Thursday, July 31, 2014 12:48 PM
To: Sara DeCair; Hernandez-Quinones, Samuel

Subject: RE: H2O language; question on

Sara and Sam,

I feel reasonably certain that Mike will want to steer from the risk range, but we'll have our division level discussions first.

Ex. 5 - Deliberative Process

Also, the AA level brief is coming soon. Do you two feel comfortable with that date? Or should we move it into September?

Lee

Lee Ann B. Veal

Director, Center for Radiological Emergency Management

Radiation Protection Division, ORIA, OAR

Office: 202-343-9448

Ex. 6 - Personal Privacy

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From: Sara DeCair **Ex. 6 - Personal Privacy**
Sent: Thursday, July 31, 2014 10:48 AM
To: Veal, Lee; Hernandez-Quinones, Samuel
Subject: Fwd: H2O language; question on

Lee, Sam,

(((respond to decair.sara@epa.gov -- I'm just having a tough time getting in to webmail this morning but I am reading msgs on iPhone)))

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

For instance, the Subcommittee has been working on draft language that summarizes prior PAG basis discussions from the 1992 Manual, in this case for evacuation, which has higher costs and detriments than providing alternative water:

"... Conformance to Principle 1 (avoidance of acute health effects) is assured by the low risk required to satisfy Principle 2 (acceptable risk of delayed health effects), and thus requires no additional consideration. Based on Principle 2, evacuation of the general population is not justified below 0.5 rem. This represents a risk of about 0.0002 of fatal cancer. Maximum lifetime risk levels considered acceptable by EPA from routine operations of individual sources range from 0.000001 to 0.0001. Risk levels that are higher than this must be justified on the basis of the emergency nature of a situation. In this case, we judge that up to an order of magnitude higher combined risk from all phases of an incident may be justifiable. The choice of 0.5 rem avoided dose as an appropriate criterion for an acceptable level of risk during the early phase is a subjective judgment that includes consideration of possible contributions from exposure during other phases of the incident.

Principle 4 (risk from the protective action must be less than that from the radiation risk avoided) supplies a lower bound of 0.03 rem on the dose at which evacuation of most members of the public is justified. The lower bound was derived from the risk of death from traffic accidents in emergency evacuations, using the factor of 0.0003 cancer deaths per person-rem. Finally, under Principle 3 (cost/risk considerations) evacuation is justified only at values equal to or greater than 0.5 rem. This will be limiting unless lower values are required for purely health-based reasons (Principle 2). But this is not the case. The single lower purely health-based value, 0.1 rem, is only valid as a health-based criterion for chronic exposure.

In summary, we have selected the value 0.5 rem as the avoided dose which justifies evacuation, because 1) it limits the risk of delayed effects on health to levels adequately protective of public health under emergency conditions, 2) the cost of implementation is justified, and 3) it satisfies the two bounding requirements to avoid acute radiation effects and to avoid increasing risk through the protective action itself."

Ex. 5 - Deliberative Process

Thanks much,

Sara (respond to decair.sara@epa.gov -- I'm just having a tough time getting in to webmail this morning but I am reading msgs on iPhone)

---------- Forwarded message ----------
From: **DeCair, Sara** <DeCair.Sara@epa.gov>
Date: Thu, Jul 31, 2014 at 10:28 AM
Subject: Fwd: H2O language; question on
To: "saradianedecair@gmail.com" <saradianedecair@gmail.com>

Sent from my iPhone

Begin forwarded message:

From: "Veal, Lee" <Veal.Lee@epa.gov>
Date: July 30, 2014 at 4:42:03 PM EDT
To: "DeCair, Sara" <DeCair.Sara@epa.gov>, "Hernandez-Quinones, Samuel" <Hernandez.Samuel@epa.gov>
Subject: H2O language; question on

Hi Sam and Sara,

I am glad to see the briefings scheduled and your dialogue on the water PAG.

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

Lee

Lee Ann B. Veal

Director, Center for Radiological Emergency Management

Radiation Protection Division, ORIA, OAR

Office: 202-343-9448

Ex. 6 - Personal Privacy

www.epa.gov/radiation

From: DeCair, Sara
Sent: Tuesday, July 29, 2014 1:20 PM
To: Hernandez-Quinones, Samuel
Cc: Veal, Lee; Perrin, Alan
Subject: H2O language; briefing schedule

Sam,

This looks great to me for FR language. (See below, no comments from me.) I assume it, with some process points, will make up our briefings coming up in August. I think briefing materials are due Monday, Aug. 4th. I'm out til then but can keep in touch via email or get on a call if you'd like to discuss how best to get what we need from DDs as we look toward the AAs conversation.

Thanks for letting me know what you think (email is easiest).

Ex. 6 - Personal Privacy

From: Hernandez-Quinones, Samuel
Sent: Tuesday, July 15, 2014 4:01 PM
To: DeCair, Sara
Subject: RE: Got some language to share?

Hi Sara,

Ex. 6 - Personal Privacy

Anyways, below you will find a draft version I've been working on which I believe will be the language that will be proposed in a future FRN.

I will send you additional language which I intend to be placed as an appendix to the subsequent PAG Document.

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

Thank You

Sam

==

Samuel Hernández Quiñones, P.E.
Environmental Engineer
Environmental Protection Agency
Office of Water
1200 Pennsylvania Ave. NW
Washington, DC 20460
202-564-1735

"USEPA Protecting Human Health and the Environment"

From: DeCair, Sara
Sent: Friday, July 11, 2014 2:51 PM
To: Hernandez-Quinones, Samuel
Subject: Got some language to share?

Ex. 6 - Personal Privacy

You'll see we have some briefings set up in August, and in preparation for that, I hope you can share your draft language with the considerations we talked about. Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

Thanks for letting me know what we can work on next – I am on travel the next couple weeks but feverishly finishing my PAG Manual redline version for reviews now, so definitely working on this topic as my top priority!

Sara

Sara D. DeCair

http://www.epa.gov/radiation/rert/pags.html

202-343-9108

To: Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]; Christ, Lisa[Christ.Lisa@epa.gov]; Veal, Lee[Veal.Lee@epa.gov]
From: DeCair, Sara
Sent: Fri 7/11/2014 8:29:38 PM
Subject: FYI: Briefing deadlines for Protective Actions for Drinking Water

Sam, Lisa and Lee,

The deadlines for our briefing materials are below. I'll be on travel, working offsite and on vacation for the next several weeks, but will be keeping PAGs as my top priority. Please call my cell (Ex. 6 - Personal Privacy) anytime, or email me with ideas & materials to review.

Cheers!

Sara

From: Gillam, Connie
Sent: Wednesday, July 09, 2014 11:12 AM
To: DeCair, Sara
Cc: Ferguson, Rafaela; Veal, Lee; Forinash, Betsy
Subject: Schedule of Briefings for Protective Actions for Drinking Water

Good morning, Sara.

Now that the briefings on *Protective Actions for Drinking Water in a Radiological Incident* have been scheduled, I want to make sure that the full schedule of briefings and briefing material submissions are available.

1. Joint Briefing for Division Directors (Edwards and Burneson): Thursday, August 7, @ 1:00 p.m.

Briefing materials are due to RPD Immediate Office on **Tuesday, August 5**

2. Joint Briefing for Office Directors (Flynn and Grevatt): Thursday, August 14, @ 1:00 p.m.

Briefing materials are due to ORIA, RPD and OGWDW on **Tuesday, August 12**

3. Joint Briefing for Acting OAR Administrator and OW Administrator (McCabe and Stoner): Tuesday, August 19, @ 3:30 p.m.

Briefing materials are due to OAR, ORIA, RPD and OW on **Friday, August 15**

To: Ellis, Jerry[Ellis.Jerry@epa.gov]; Christ, Lisa[Christ.Lisa@epa.gov]
Cc: Veal, Lee[Veal.Lee@epa.gov]
From: DeCair, Sara
Sent: Thur 6/26/2014 8:41:28 PM
Subject: Some water language + materials that might be useful
PAGs 101 6-26-2014.ppt
PAGFactSheet4-15-13.pdf

All; for the next week while Sam and I are out, I hope this light reading is helpful (see body of email below and attachments). I still hope to put some more words around the basis for the adult water guideline, based on the early 1990s analyses that were done, but this will get us started. I look forward to seeing Sam's draft language.

Thanks,

Sara

From: DeCair, Sara
Sent: Thursday, June 19, 2014 11:49 AM
To: Hernandez-Quinones, Samuel
Subject: Quick look at some language

Sam,

I still want to write a couple sentences summarizing the basis from our 1990s water studies, balancing costs/detriments and radiation risks, but here is what I would suggest for the lower tier language:

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

And here's what I have, so far, it's just draft – for why age groups make sense only for the ingestion part of rad pathways:

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

Thanks for sharing your draft language, and for a good conversation today!

Sara D. DeCair

http://www.epa.gov/radiation/rert/pags.html

Ex. 6 - Personal Privacy

Fact Sheet

Revision of the "PAG Manual: Protective Action Guides and Planning Guidance for Radiological Incidents"

What are Protective Action Guides (PAGs)?

In the event of a radiological emergency, decision-makers can direct the members of the public to take protective actions to avoid exposure to unhealthy amounts of radiation. Protective Action Guides (PAGs) are radiation dose guidelines that trigger protective actions such as evacuation or staying indoors.

EPA developed a Manual of Protective Action Guides (the "PAG Manual") to help federal, state and local authorities decide how to protect the public during radiological emergencies. Emergency response organizations use the guidance in the PAG Manual in their emergency response planning.

PAGs are for use only in emergencies. PAGs are not legal radiation limits, and do not supersede any environmental laws or regulations. The PAG Manual provides emergency responders with flexible guidance on protective actions because every incident is different. State and local officials can take actions to protect the public based on incident-specific conditions.

Why has EPA updated the PAG Manual?

The last version of the PAG Manual was issued in 1992. Since then, there have been advancements in scientific understanding of radiation dose and risk to human health. EPA worked with multiple federal agencies including the Department of Homeland Security, Federal Emergency Management Agency, Department of Energy, Department of Health and Human Services, Nuclear Regulatory Commission, Occupational Safety and Health Administration and Department of Defense to develop the revised PAG Manual. EPA believes that guidance based on the best available science can help local authorities save lives and minimize the impact of a radiological emergency. Local authorities rely on EPA guidance to keep their emergency response plans up-to-date with the most current science.

EPA is soliciting input from the public on this proposed revision of the PAG Manual, and will consider the comments received when writing the final document.

This proposed revision to the PAG Manual includes updated dose calculations based on the latest science. A number of other changes in the revised PAG Manual are based on lessons learned from actual radiological emergencies, including the Fukushima nuclear power plant accident. Significant changes in the new manual include—

- **Use of PAGs in Different Types of Radiological Emergencies:** The updated PAG Manual now applies to a broader range of radiological emergencies, including terrorist acts. The 1992 version, while it applied to all radiological emergencies, was heavily focused on nuclear power plant incidents.

- **Food Guidance:** Planners are referred to current guidance on radioactive contamination in food from the U.S. Food and Drug Administration (FDA). The previous version of the PAG Manual included an older FDA food guidance document that has been significantly updated since 1992.

- **Administration of Potassium Iodide (KI):** In this update, EPA has adopted the latest guidance from FDA on administration of a potassium iodide (KI), a compound that inhibits the thyroid's uptake of radioactive iodine taken into the body. (Note: Administration of KI is an appropriate protective action only in emergencies that involve radioactive iodine; it does not provide protection against other radioactive substances.)

- **Guidance on Reentry**: The update contains brief planning guides on reentry to areas from which people have been removed because of a radiological incident.

- **Cleanup and Waste Disposal Considerations**: The proposed revision provides brief guidance for planning a cleanup process and considerations for planning the disposal of radioactive waste. Cleanup and waste disposal decisions will involve careful coordination with stakeholders throughout the process.

- **Drinking Water Considerations:** EPA is not proposing a specific drinking water PAG at this time. The Agency recognizes a short-term emergency drinking water guide may be useful for public health protection during a large-scale incident, as demonstrated by the Fukushima nuclear power plant accident. EPA asks for public comments on this subject.

When would the PAG Manual be used?

The PAG Manual provides federal, state, and local emergency planners with guidance they can use in their emergency response plans. It provides information for each phase of a radiological incident—

- **Early or Emergency Phase:** This is the beginning of the incident, when immediate decisions must be made about actions to protect the public. This phase can last hours to days.

- **Intermediate Phase**: This period, lasting weeks to months, begins after the radiation releases have been brought under control, and reliable environmental measurements are available for use as a basis for decisions on protective actions.

- **Late or Recovery Phase:** This period, lasting months to years, is no longer a response to an emergency. Activities during this phase support site restoration and cleanup.

Where can I find more information?

Visit our web page to learn more and download the PAG Manual:

http://www.epa.gov/radiation/rert/pags.html

EPA Protective Action Guides

PAGs 101

Promoting radiation safety worldwide.

Outline

- What is a PAG
- Phases of Emergency Response
  - Early Phase
  - Intermediate Phase
  - Late Phase
- Key Updates

What is a PAG

- A value against which to compare the projected dose to a defined individual from a release of radioactive material at which a specific protective action to reduce or avoid that dose is warranted
- Guidance for public officials
- Protective Action Guides are called 'PAGs'

Phases of Response

- Early Phase: The first hours to days until the release has stopped, when protective actions decisions must be made with little to no information
- Intermediate Phase: The weeks to months when more information is available, protective actions are more restrictive, and cleanup planning begins
- Late Phase: No longer an emergency response; activities shift to long term recovery and cleanup

Early Phase PAGs

- Evacuation/Shelter 1-5 rem (10-50 mSv)
- KI 5 rem (50 mSv) child thyroid dose
- Worker 5, 10, 25+ rem (50, 100, 250+ mSv)

Intermediate Phase PAGs

- Relocate population
  - ✓ ≥ 2 rem (20 mSv) first year (projected dose)
  - ✓ 0.5 rem (5 mSv) any subsequent year
- Apply dose reduction techniques
  - ✓ < 2 rem (20 mSv)
- Food (FDA 1998): Most limiting of
  - ✓ 0.5 rem (5 mSv) whole body or
  - ✓ 5 rem (50 mSv) to most exposed organ or tissue

Late Phase

- Actions designed to reduce radiation levels in the environment begin
- Actions are meant to reduce long-term exposures and improve living conditions.
  - A PAG level, or dose to avoid, is not appropriate for long-term cleanup
  - Manual describes important aspects of process and participants in decision making on clean-up goals, technology, land use and approaches
- Stakeholder involvement is key

2013 Revised PAG Manual

- Update to the 1992 PAG Manual
  - ✓ Expanded scope to include RDD, IND
  - ✓ Incorporated updated Potassium Iodide guidance
  - ✓ Refers to updated FDA Food guidance
  - ✓ Includes a new matrix on re-entry decisions
  - ✓ Provides brief cleanup and waste management planning guidance
  - ✓ Incorporates DHS 2008 late phase cleanup guidance
  - ✓ Updates science basis to latest international guides

Wrap Up

- Questions?
- Comments?
- Suggestions?

To: DeCair, Sara[DeCair.Sara@epa.gov]; Christ, Lisa[Christ.Lisa@epa.gov]
Cc: Ellis, Jerry[Ellis.Jerry@epa.gov]; Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]
From: Veal, Lee
Sent: Thur 6/26/2014 1:13:19 PM
Subject: RE: draft scheduler request for AAs on PAGs

Sara,

This looks good to me. We'll have our move completed before the DD meeting, which is helpful.

Lisa,

How are schedules on the OGWDW end? Is this a reasonable approach to you?

Lee

Lee Ann B. Veal

Director, Center for Radiological Emergency Management

Radiation Protection Division, ORIA, OAR

Office: 202-343-9448

Ex. 6 - Personal Privacy

www.epa.gov/radiation

From: DeCair, Sara
Sent: Thursday, June 26, 2014 8:59 AM
To: Veal, Lee; Christ, Lisa
Cc: Ellis, Jerry; Hernandez-Quinones, Samuel
Subject: draft scheduler request for AAs on PAGs

Lee, Lisa, how does this look? I can queue it up through Jon's scheduler, Connie, to coordinate with Mason from the DDs level.

Meeting request for Janet McCabe and Nancy Stoner, AAs of Air and Water, respectively: "Protective actions for drinking water in a radiological incident."

- One hour, in mid or late August 2014. Briefing materials will be provided in advance.

- Key participants:

  - Mike Flynn, Peter Grevatt, Jon Edwards, Alan Perrin, Eric Burneson, Lee Veal, Lisa Christ, Sam Hernandez-Quinones, Sara DeCair

- Additional invitees:

  - Jerry Ellis, Mike Boyd

- Pre-briefs requested beforehand:

  - Office Directors Mike Flynn and Peter Grevatt, by the first week of August

- Division Directors Jon Edwards and Eric Burneson, by the end of July

Thanks!

S.

Sara D. DeCair

http://www.epa.gov/radiation/rert/pags.html

202-343-9108

To: Veal, Lee[Veal.Lee@epa.gov]; Christ, Lisa[Christ.Lisa@epa.gov]
Cc: Ellis, Jerry[Ellis.Jerry@epa.gov]; Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]
From: DeCair, Sara
Sent: Thur 6/26/2014 12:59:16 PM
Subject: draft scheduler request for AAs on PAGs

Lee, Lisa, how does this look? I can queue it up through Jon's scheduler, Connie, to coordinate with Mason from the DDs level.

Meeting request for Janet McCabe and Nancy Stoner, AAs of Air and Water, respectively: "Protective actions for drinking water in a radiological incident."

• One hour, in mid or late August 2014. Briefing materials will be provided in advance.

• Key participants:

o Mike Flynn, Peter Grevatt, Jon Edwards, Alan Perrin, Eric Burneson, Lee Veal, Lisa Christ, Sam Hernandez-Quinones, Sara DeCair

• Additional invitees:

o Jerry Ellis, Mike Boyd

• Pre-briefs requested beforehand:

o Office Directors Mike Flynn and Peter Grevatt, by the first week of August

o Division Directors Jon Edwards and Eric Burneson, by the end of July

Thanks!

S.

Sara D. DeCair

http://www.epa.gov/radiation/rert/pags.html

202-343-9108

To: Burneson, Eric[Burneson.Eric@epa.gov]; Christ, Lisa[Christ.Lisa@epa.gov]; Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]
Cc: Flynn, Mike[Flynn.Mike@epa.gov]; Grevatt, Peter[Grevatt.Peter@epa.gov]; Perrin, Alan[Perrin.Alan@epa.gov]
From: Veal, Lee
Sent: Wed 5/21/2014 7:56:35 PM
Subject: Water studies supporting PAG development
Analysis in Support of PAG for Drinking Water.PDF
Cost of Providing Alternate Drinking Water.PDF
Exposure Pathways for Water.PDF
Transport of Deposited Radioactivity to Surfacewater.PDF

Dear Eric, Lisa and Sam,

Thank you again for our briefing yesterday. I think that we're making progress and I look forward to more. I am particularly appreciative of the time and effort that Sam has been putting into this effort with Sara.

The attached files contain some historical references that we have on drinking water issues and PAGs. They are all from the 1990s, about the time of the development of the 1992 PAG document. I believe that I was to forward these documents as one of my actions from yesterday's brief.

Lee

Lee Ann B. Veal
Director, Center for Radiological Emergency Management
Radiation Protection Division, ORIA, OAR

Office: 202-343-9448
Cell: 202-617-4322

www.epa.gov/radiation

To: Mason, Paula[Mason.Paula@epa.gov]
Cc: Christ, Lisa[Christ.Lisa@epa.gov]
From: Hernandez-Quinones, Samuel
Sent: Fri 5/16/2014 7:14:11 PM
Subject: Briefing Materials
Joint Briefing PGrevatt-Flynn May-16 SHQ.docx

Hi Paula,

Attached are the briefing materials for Peter's Joint meeting on Tuesday (6/20) with Myke Flynn from the Office of Air.

Let me know if there are any questions.

Thank You

Sam

==

Samuel Hernández Quiñones, P.E.
Environmental Engineer
Environmental Protection Agency
Office of Water
1200 Pennsylvania Ave. NW
Washington, DC 20460
202-564-1735

"USEPA Protecting Human Health and the Environment"

To: Christ, Lisa[Christ.Lisa@epa.gov]
From: Burneson, Eric
Sent: Thur 5/15/2014 6:42:16 PM
Subject: Re: Revised Document

I agree but I just left one suggested change on your voice mail

---

From: Christ, Lisa
Sent: Thursday, May 15, 2014 2:38:39 PM
To: Burneson, Eric
Subject: RE: Revised Document

No problem – it incorporates the changes we discussed with ORIA.

From: Burneson, Eric
Sent: Thursday, May 15, 2014 2:07 PM
To: Christ, Lisa
Subject: RE: Revised Document

I wont have time sorry.

From: Christ, Lisa
Sent: Thursday, May 15, 2014 1:11 PM
To: Burneson, Eric
Cc: Oshida, Phil
Subject: FW: Revised Document

Hi Eric,

Attached is the revised version of the radiation PAGs briefing for Peter and Mike on May 20. This version is a collaboration between OW-Sam and ORIA-Sara,. ORIA needs to submit briefing materials tomorrow. Let me know if you'd like to review/comment.

Thanks-

Lisa

From: Hernandez-Quinones, Samuel
Sent: Thursday, May 15, 2014 11:54 AM
To: Christ, Lisa
Subject: Revised Document

Hi Lisa,

This version has the basis for the portion of DW from the total Food Diet.

Sam

==

Samuel Hernández Quiñones, P.E.
Environmental Engineer
Environmental Protection Agency
Office of Water
1200 Pennsylvania Ave. NW
Washington, DC 20460
202-564-1735

"USEPA Protecting Human Health and the Environment"

To: Christ, Lisa[Christ.Lisa@epa.gov]
From: Burneson, Eric
Sent: Thur 5/15/2014 6:07:05 PM
Subject: RE: Revised Document

I wont have time sorry.

From: Christ, Lisa
Sent: Thursday, May 15, 2014 1:11 PM
To: Burneson, Eric
Cc: Oshida, Phil
Subject: FW: Revised Document

Hi Eric,

Attached is the revised version of the radiation PAGs briefing for Peter and Mike on May 20. This version is a collaboration between OW-Sam and ORIA-Sara,. ORIA needs to submit briefing materials tomorrow. Let me know if you'd like to review/comment.

Thanks-

Lisa

From: Hernandez-Quinones, Samuel
Sent: Thursday, May 15, 2014 11:54 AM
To: Christ, Lisa
Subject: Revised Document

Hi Lisa,

This version has the basis for the portion of DW from the total Food Diet.

Sam

==

Samuel Hernández Quiñones, P.E.
Environmental Engineer
Environmental Protection Agency
Office of Water
1200 Pennsylvania Ave. NW
Washington, DC 20460
202-564-1735

"USEPA Protecting Human Health and the Environment"

To: Christ, Lisa[Christ.Lisa@epa.gov]
From: Hernandez-Quinones, Samuel
Sent: Mon 5/12/2014 6:22:31 PM
Subject: RE: draft briefing paper for rads PAG???
Joint Brieifng PGrevatt-Flynn May-12 SHQ.docx

see attached.

Sam

==

Samuel Hernández Quiñones, P.E.
Environmental Engineer
Environmental Protection Agency
Office of Water
1200 Pennsylvania Ave. NW
Washington, DC 20460
202-564-1735

"USEPA Protecting Human Health and the Environment"

From: Christ, Lisa
Sent: Monday, May 12, 2014 2:16 PM
To: Hernandez-Quinones, Samuel
Subject: draft briefing paper for rads PAG???

Do you have the revised document ready so we can discuss during the call?

Thanks-

~~~~~~

Lisa Christ, Acting Chief

Targeting and Analysis Branch

Office of Ground Water and Drinking Water

USEPA

1200 Pennsylvania Ave NW
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~~~~~~

Mail Code: 4607M

To: Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]; Ellis, Jerry[Ellis.Jerry@epa.gov]; Christ, Lisa[Christ.Lisa@epa.gov]; Veal, Lee[Veal.Lee@epa.gov]
From: DeCair, Sara
Sent: Thur 5/8/2014 4:40:39 PM
Subject: draft Water briefing for ODs -- Sara's markup
Joint Brief Grevatt-Flynn Sara markup 5-8-2014.docx

Sam,

I didn't do all the deletions that I am suggesting, but I hope I've provided enough of my perspective to help you decide which of my edits to take. It's easier to look at with "No Markup" but see what you think about my adjusted Recommendations, the table, and a shorter timeline that focuses on things ODs would care about.

Lee helped me with these suggestions and I'm sure between you, me, Lisa and Lee, we can get a very good version together for our next pre-briefing which is at 2:30 pm on Monday, via phone bridge. Call or write with any questions or concerns – thanks!!

Sara

Sara D. DeCair

http://www.epa.gov/radiation/rert/pags.html

202-343-9108

To: Christ, Lisa[Christ.Lisa@epa.gov]
From: Hernandez-Quinones, Samuel
Sent: Thur 5/1/2014 7:14:54 PM
Subject: Revised Briefing Paper.
Briefing for PGrevatt_SHQ 5-1.docx

Attached.

Sam

==

Samuel Hernández Quiñones, P.E.
Environmental Engineer
Environmental Protection Agency
Office of Water
1200 Pennsylvania Ave. NW
Washington, DC 20460
202-564-1735

"USEPA Protecting Human Health and the Environment"

To: Christ, Lisa[Christ.Lisa@epa.gov]; Veal, Lee[Veal.Lee@epa.gov]; Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]; Ellis, Jerry[Ellis.Jerry@epa.gov]
Cc: Perrin, Alan[Perrin.Alan@epa.gov]; Edwards, Jonathan[Edwards.Jonathan@epa.gov]; Burneson, Eric[Burneson.Eric@epa.gov]
From: DeCair, Sara
Sent: Wed 3/19/2014 3:13:12 PM
Subject: Copies: H2O briefing

Lisa, thanks for the offer. Lee printed 7 copies that we'll bring over and has sent the brief to Mike Flynn. See you at 3:30 pm.
Sara

From: Christ, Lisa
Sent: Wednesday, March 19, 2014 8:53:22 AM
To: DeCair, Sara; Veal, Lee; Hernandez-Quinones, Samuel; Ellis, Jerry
Cc: Perrin, Alan; Edwards, Jonathan; Burneson, Eric
Subject: RE: Plz choose final version & send to Mike Flynn: H2O briefing

Hi Sara,

I've attached the version Sam sent Peter yesterday. I think the content is mostly the same between the two versions, with a slight difference in presentation of the "potential protective actions". We're happy to make changes if you'd like and we can print revised copies before the meeting.

Lisa

From: DeCair, Sara
Sent: Wednesday, March 19, 2014 8:34 AM
To: Christ, Lisa; Veal, Lee; Hernandez-Quinones, Samuel; Ellis, Jerry
Cc: Perrin, Alan; Edwards, Jonathan; Burneson, Eric
Subject: Plz choose final version & send to Mike Flynn: H2O briefing

Hi all, sorry if my being out the last two days caused any last minute mix of versions of this briefing! I'm hosting an ORD briefing til 11 am so I can't respond to email or phone calls.

Attached are two versions I got yesterday about 2:45 pm and if OW could choose which clean version you'd like to go with as final, I hope we can send it to Mike Flynn this morning. He was just asking for a read-ahead. I can make copies before we come over.

Thanks for all your work on this and see you later this afternoon,

Sara

From: Christ, Lisa
Sent: Tuesday, March 18, 2014 12:07 PM
To: Veal, Lee; DeCair, Sara; Hernandez-Quinones, Samuel; Ellis, Jerry
Cc: Perrin, Alan; Edwards, Jonathan; Burneson, Eric
Subject: RE: Some edits to H2O briefing; due Monday

Hi Lee,

We're planning to brief OW decision makers on the table described below in mid/late May.

Our intent is to have an OW decision at this briefing.

Lisa

From: Veal, Lee
Sent: Tuesday, March 18, 2014 11:53 AM
To: Christ, Lisa; DeCair, Sara; Hernandez-Quinones, Samuel; Ellis, Jerry
Cc: Perrin, Alan; Edwards, Jonathan; Burneson, Eric
Subject: RE: Some edits to H2O briefing; due Monday

Lisa,

Thank you so much for the edits and markup.

Would it be possible to identify any scheduling information for when key items might be available? I suspect that Mike will be asking. I am thinking most specifically about these next items:

SRMD Proposed Approach for Developing Options for a Drinking Water PAG

-

- SRMD will prepare a table with a range of dose values based on resulting projected risks for different targeted sub populations and different time scales.

  - The table will provide detailed information for EPA leadership to select a drinking water PAG.

  - Select a single PAG value or a range of values to allow state and local emergency responders increased flexibility.

Lee

Lee Ann B. Veal

Director, Center for Radiological Emergency Management

Radiation Protection Division, ORIA, OAR

Office: 202-343-9448

Cell: 202-617-4322

www.epa.gov/radiation

From: Christ, Lisa
Sent: Tuesday, March 18, 2014 9:02 AM
To: DeCair, Sara; Hernandez-Quinones, Samuel; Ellis, Jerry
Cc: Perrin, Alan; Veal, Lee; Edwards, Jonathan; Burneson, Eric
Subject: RE: Some edits to H2O briefing; due Monday

Hi Sara,

I wanted to catch up after our email exchange yesterday. I've attached the briefing document that incorporates my revisions. I moved the precautionary actions out of the table and into a new section. Let me know if we need to make any other changes or you'd like to discuss mine.

Thanks-

Lisa

From: DeCair, Sara
Sent: Friday, March 14, 2014 5:11 PM
To: Hernandez-Quinones, Samuel; Christ, Lisa; Ellis, Jerry
Cc: Perrin, Alan; Veal, Lee; Edwards, Jonathan
Subject: Some edits to H2O briefing; due Monday

Sam,

Ex. 5 - Deliberative Process

Once it's approved over there, send it back to us to distribute as advance reading before Wednesday's meeting. Thanks, and see you next week!

Sara

Sara D. DeCair

http://www.epa.gov/radiation/rert/pags.html

202-343-9108

To: Lopez-Carbo, Maria[Lopez-Carbo.Maria@epa.gov]; Mason, Paula[Mason.Paula@epa.gov]
Cc: Christ, Lisa[Christ.Lisa@epa.gov]
From: Hernandez-Quinones, Samuel
Sent: Tue 3/18/2014 8:27:45 PM
Subject: Document for Peter's Briefing on 3/19/14 DW PAGs
Grevatt-Flynn Briefing PAGs 3-18-2014_SHQ.docx

Document for Peter's Joint Briefing with Mike Flynn is Attached.

Thank You

Sam

==

Samuel Hernández Quiñones, P.E.
Environmental Engineer
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202-564-1735

"USEPA Protecting Human Health and the Environment"

To: Christ, Lisa[Christ.Lisa@epa.gov]
From: Lisa Christ
Sent: Mon 3/17/2014 8:12:25 PM
Subject: Drinking Water PAG briefing
Grevatt-Flynn Briefing PAGs sara markup 3-14-2014_LC.docx

To: Christ, Lisa[Christ.Lisa@epa.gov]; Ellis, Jerry[Ellis.Jerry@epa.gov]
From: Hernandez-Quinones, Samuel
Sent: Fri 3/14/2014 7:10:01 PM
Subject: Joint Meeting DW PAG
Grevatt-Flynn Briefing PAGs Feb 2014 Ver 3-14-14.docx

Hi Lisa,

after working with Sarah I made a few changes to the briefing sheet that was originally prepared for Peter. I think this document more clearly captures the overall idea of what we are proposing as the approach on the DW PAG. Please see the attached document and let me know if you have any comments or suggested changes. I will then send any updated version to Sarah, who is also in the process of getting feedback from her management.

I will also let you know if we get any comments from ORIA.

Thank You

Sam

==

Samuel Hernández Quiñones, P.E.
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"USEPA Protecting Human Health and the Environment"

To: Christ, Lisa[Christ.Lisa@epa.gov]; Ellis, Jerry[Ellis.Jerry@epa.gov]
From: Hernandez-Quinones, Samuel
Sent: Tue 2/11/2014 5:36:18 PM
Subject: RE: Rads PAG briefing for Peter
Grevatt Briefing PAGs Feb 2014 Ver4.docx

Revised Paper Attached.

Sam

From: Christ, Lisa
Sent: Tuesday, February 11, 2014 11:54 AM
To: Hernandez-Quinones, Samuel; Ellis, Jerry
Subject: Rads PAG briefing for Peter

We need to get the briefing paper to Maria by 330pm today. Eric asked for a few revisions, please send me the revised briefing paper as soon as possible so I can forward to Maria before the deadline.

Thanks-

Lisa

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Lisa Christ, Associate Chief

Targeting and Analysis Branch

Office of Ground Water and Drinking Water

USEPA

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~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

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To: Christ, Lisa[Christ.Lisa@epa.gov]
Cc: Ellis, Jerry[Ellis.Jerry@epa.gov]
From: Hernandez-Quinones, Samuel
Sent: Thur 2/6/2014 2:33:27 PM
Subject: RE: status of briefing materials for Rads PAG
Grevatt Briefing PAGs Feb 2014 Ver3.docx

Lisa,

Find attached the most recent version of the Briefing paper.

Sam

From: Christ, Lisa
Sent: Tuesday, February 04, 2014 1:00 PM
To: Hernandez-Quinones, Samuel; Ellis, Jerry
Subject: status of briefing materials for Rads PAG

Just wanted to check in on the briefing paper. I'd like to review the briefing paper tomorrow – have you received comments from ORIA?

If I can, I'll reschedule the briefing for Eric so Jerry can attend. It may be tight given Peter's briefing is next week…

To: Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]
Cc: Christ, Lisa[Christ.Lisa@epa.gov]
From: Ellis, Jerry
Sent: Mon 1/27/2014 10:22:29 PM
Subject: PAG Public comments letters from ORIA
All PAG Comments except Form Letters-10 21 2013 Drinking Water Comment in Highlights.pdf

Hey Sam,

Sending back the PAG public comment letters with all of the drinking water related comments that we will have to answer shown in highlights.

Jerry L. Ellis, Jr.

Physical Scientist

Standards and Risk Management Division

Office of Ground Water and Drinking Water

U.S. Environmental Protection Agency

1200 Pennsylvania Ave. (4607M), N.W.

Washington, D.C. 20460

Phone: 202-564-2766

Protective Action Guides Manual; Updates: Protective Action Guides and Planning Guidance for Radiological Incidents (Document ID EPA-HQ-OAR-2007-0268-0001)

Comments submitted by:

Alan Fellman, Ph.D., CHP
Olney, Maryland
Alan.fellman@moellerinc.com

On page 8, the document states “evacuation of a population of 50,000 carries with it a statistical risk of injury or death from transportation hazards or increased exposure.” This statement ignores the data from Fukushima, which proves beyond any doubt that wide-scale evacuation causes disease and fatalities. To date, there are close to 1,000 evacuation related deaths in the population relocated following the accident at Fukushima, from suicide, heart attacks, and other causes. Depression, alcoholism, and other infirmities are highly elevated in the evacuated population. EPA ignores this very real impact on public health.

Section 2.6 on Emergency Response Personnel – EPA establishes a guideline level of 5 rem for emergency responders and acknowledges that higher doses may be unavoidable and incident commanders should have flexibility in their application. On page 26, EPA notes “…incident commanders and other responders need to understand the risk posed by such exposures (in excess of 5 rem) in order to make informed decisions.” And for doses greater than 5 rem, EPA states that workers should be made “fully aware of the sub-chronic and chronic risks involved, including numerical estimates of the risk of delayed health effects.” These comments are embarrassingly naïve on several levels. It seems that EPA has lost sight of the fact that they are addressing **emergency response personnel**. Who among us can forget the images of first responders running into the remaining World Trade Center tower in an effort to save lives after the first tower collapsed? Three days ago, we all watched the video from the Boston Marathon when, immediately after the explosions, runners and pedestrians were running away from the blasts as the first responders were running toward the blast locations so that they could assist in any way possible. Somehow EPA feels that emergency response workers need to focus on numerical estimates of delayed health effects (which will fall out at a few percent) based on a linear, non-threshold hypothesis that most scientists acknowledge is not quantitative in the dose range under consideration. This only serves to further the radiation phobia that is so prevalent among the general public.

Table 2.2 establishes the numeric guidelines which are unchanged from the previous PAG document, starting with 5 rem for response actions, 10 rem to protect valuable property, and 25 rem for lifesaving. EPA notes that the 25 rem dose “could increase the risk of stochastic effects, such as the risk of cancer.” And later states that this guideline should be exceeded “only when the benefits of the action clearly exceed the associated risks.” The risk to emergency personnel at the 25 rem level, according to EPA, is 1.5%, or 15 per 1,000 persons. EPA fails to realize here that they are talking about dose to workers involved in **LIFESAVING** operations. Does the New York City fireman run away from the World Trade Center when his/her risk reached 1.5%? I would argue that anyone who would fail to act in an emergency to save a life because his personal risk was 1.5% (even if the risk was real, as opposed to a hypothetical number based on a widely discredited hypothesis) has no business working as an emergency responder.

Section 2.7 recommends that where the dose limits for the general public are exceeded (no more than 2 mrem in any one hour and 100 mrem in a year), operations should be conducted “under the controlled conditions established for occupational exposure.” Unless I’m mistaken, EPA is recommending controlled conditions, similar to restricted areas established by radioactive materials licensees at their facilities, in conditions that might cause a member of the public to receive a dose exceeding 100 mrem in one year. It’s not clear what these “controlled conditions” would consist of, but this would seem to have the potential to be a colossal waste of resources. What benefit to the public health would result from such actions? To base policy on the assumption that limited resources are well spent over tens of mrem is disingenuous at best. Similarly, EPA recommends decisions on decontamination of equipment and other items based on a criterion of exceeding two times background. What does society gain by massive decontamination projects for items with two to three times background count rates due to low level surface contamination following a radiological incident? Should people be without the use of their cars and trucks for an indeterminate period of time, waiting for these low levels of surface activity to be removed? Might the resources involved in such efforts be better used elsewhere?

Chapter 3 covers the intermediate phase and establishes recommendations for relocation of the public when doses would exceed 2 mrem in the first year and 0.5 mrem/year in subsequent years. These recommendations are offered despite EPA’s acknowledging that relocation is highly disruptive. As noted above, the Fukushima evacuation has, to date, been responsible for almost 1,000 fatalities in the approximately 100,000 persons forced to relocate. At 0.5 rem per year (or doses slightly greater than that), the expected impact on public health is **ZERO**. Yet EPA would prefer to have people abandon their homes, businesses, schools, livelihoods, etc. to “protect” them from a 0.5+ rem annual dose? To put in place recommendations that would lead to similar negative impact on public health, just to save the population from doses in the neighborhood of 0.5 rem per year is indefensible. If I was one of those affected members of the public, I would refuse to evacuate.

Marcus M. Kessler, M.D., Dr.med. (DE)
DABR®, Radiology (AEKNO), MedicalInformatics (AEKNO)
Clinical Instructor
UAMS Radiation Safety Committee Member
UAMS COM Nuclear Medicine PET ServiceCourse Director
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4301 W. Markham St. Slot 556
Little Rock, AR 72205

Date: May 08, 2013

Air and Radiation Docket and Information Center
Environmental Protection Agency
Mail Code: 6102T
1200 Pennsylvania Ave NW.
Washington, DC 20460

Attn: Docket ID No. EPA-HQ-OAR-2007-0268
Abstract: Federal Register of April 15, 2013, (78 FR 22257)(FRL-9707-2)
Federal Register Number: 2013-08666
FR Citation: 78
Start-End Page: 22257 - 22260
Comment Start Date: Apr 15, 2013
Comment Due Date: Jul 15, 2013

Dear Madam, dear Sir,

I respectfully submit the following comments for your review and consideration, which I have based on my own review of the literature, as well as on in depth discussions with my colleagues.

1) I request that SI-units be exclusively used or that these are at least given the preference (with Imperial units possibly in parenthesis) throughout the 2013 PAG Manual. Especially Table 2-3 is very confusing in it's use of the unit "R", which is not defined in Appendix B – Glossary.

Rationale: The National Institute of Standards and Technology (NIST) states that: "…Other units outside the SI…should be defined in relation to the SI in every document in which they are used; their continued use is not encouraged." http://physics.nist.gov/cuu/Units/outside.html . All professional societies in Nuclear Medicine (Health Physics Society, SNM, etc.) advocate the sole or preferential use of SI-units.

Continued use of non-SI units contributes to confusion and ambiguity, resulting in significant loss of property (loss of NASA Mars orbiter, http://www.cnn.com/TECH/space/9909/30/mars.metric.02/) and possibly also loss of life given the context of the PAG manual.

2) Request is made to give consideration to revise the recommended dose limit or expand the list of the stated recommended dose limits within Table 2-2, "Response Workers Guidelines" with further guidance on their usage, or to elaborate within the table on the scien tific basis/references of deciding for a very conservative dose limit of 250mSv.

Rationale:

The recommendations of the International Atomic Energy Agency (IAEA), advises on an upper dose limit of 1000 mSv (100 rem) whole body dose for First Responders for life saving actions (Page 41)

http://www-ns.iaea.org/tech-areas/emergency/iec/frg/publications.asp ;

the National Council on Radiation Protection and Measurements recommends an upper limit of 500 mSv (50 rem) http://www.crcpd.org/rdd_handbook/rdd -handbook-forweb.pdf

and the Department of Defense recommends, "…for operations other than war and also based on mission priorities and risk analysis, military commanders limit Operational Exposure Guidance at levels to 75 rad (0.75 Gy) and below". [Note by author: if the 0.75 Gy were secondary to Gamma-radiation, it would result translate into a dose limit of 750 mSv.]

(Planning guidance response to a nuclear detonation, 2010, Page 55, Developed by the National Security Staff Interagency Policy Coordination Subcommittee for Preparedness and Response to Radiological and Nuclear Threats [the EPA was one of the participating agencies who published this guidance.] http://www.epa.gov/radiation/docs/er/planning-guidance-for-response-to-nuclear-detonation-2-edition-final.pdf))

All the cited dose limits above, are a factor 2-4 higher than those proposed in the new PAG Manual, and are based on review of the literature. Especially the IAEA dose limit of 1000mSv is very well documented.

Please also note that the proposed PAG Manual contradicts and fails to elaborate on previously issued guidance by the EPA, which suggested a dose limit of 500mSv.

(Planning guidance response to a nuclear detonation, 2010, Page 55, Developed by the National Security Staff Interagency Policy Coordination Subcommittee for Preparedness and Response to Radiological and Nuclear Threats [the EPA was one of the participating agencies who published this guidance.] http://www.epa.gov/radiation/docs/er/planning-guidance-for-response-to-nuclear-detonation-2-edition-final.pdf)

3) If decision is made to refrain from following request #2 above, request is made to give Incident Commanders more guidance on the suggested maximum dose in the "Response Workers Guidelines".

The proposed PAG Manual states:

"…in the case of a catastrophic incident, such as an IND, Incident Commanders may need to consider raising the lifesaving and valuable property (i.e., necessary for public welfare) emergency worker guidelines in order to prevent further loss of life and prevent the spread of massive destruction. …"

with no further guidance in the proposed PAG manual as to what the maximum dose limit should be.

A statement in the PAG Manual, structured along the lines of the following guidance by the DOD, would likely help Incident Commanders significantly in their decision making:

"Whereas military commanders set their Operational Exposure Guidance (OEG) (i.e., dose limits to US troops) at any level in nuclear war, the risk analysis for extremely high- priority missions, to include life-saving, yields a maximum OEG of 125 rad (1.25 Gy). For operations other than war and also based on mission priorities and risk analysis, military commanders limit OEG levels to 75 rad (0.75 Gy) and below."

(Planning guidance response to a nuclear detonation, 2010, Page 55, Developed by the National Security Staff Interagency Policy Coordination Subcommittee for Preparedness and Response to Radiological and Nuclear Threats [the EPA was one of the participating agencies who published this guidance.] http://www.epa.gov/radiation/docs/er/planning-guidance-for-response-to-nuclear-detonation-2-edition-final.pdf)

4) Request is made to include easy to read colored tables like the ones used here:

http://ctosnnsa.org/vtra/Instruments/CTOS0003aV1.0910_StayTimeTableRadDoseGuid.pdf

into the PAG Manual, as to increase usability and ease-of-use in the field for Incident Commanders during ongoing incidents. Note should however be made that the data should be in SI units, as discussed under #1 above.

5) In regards to the “Response Workers Guidelines”, it is hereby suggested that consideration be given to quote Median Lethal Dose LD5, LD30 and LD50 values for radiation exposure in the PAG manual, so that Incident Commanders have concrete guidance on the risk vs. benefit of life-saving actions.

Disclaimer: These are my personal opinions and may not reflect the views of my employer. I have no conflicts of interest to declare.

Sincerely,

Signed: MK

Chapter 4, Section 4.1.1, Transitioning from Intermediate to Late Phase Cleanup – This section states that the late phase cleanup process proceeds independently of intermediate phase protective action activities. Whereas this is true of the physical remediation activities it is more efficient if personnel involved in planning the late phase cleanup coordinate in the planning and execution of the intermediate phase cleanup as early as practicable to avoid unnecessary duplication in characterization and to establish a consistent framework for cleanup activities, transportation, and removal of waste. Recommend adding a statement similar to the above to Section 4.1.1.

Section 4.2.1, Potential Waste Volumes and Existing Waste Disposal Options – The penultimate sentence of this section discusses supplements to existing waste disposal capacity. Recommend adding something similar to "establishing a new section or cell to existing commercial or DOE disposal facilities" as a potential alternative for handling large volumes of waste.

Comments of DRAFT 2013 PAG Manual-TK mod1.docx

Comments from:
Terry Kraus
Sandia National Laboratories
tdkraus@sandia.gov

Page/Chapter/Section	Comment
4/Chapter 1/Section 1.3.4 and other places in the document	Use generic reference for the FRMAC Assessment Manual, don't reference a specific edition such as, "DOE 2010a." I'm not completely sure how the FRMAC Assessment Manual should be referenced but I recommend changing the reference to the FRMAC Assessment Manual throughout the PAG Manual to something like, "FRMAC Assessment Manual (most current version)" and then listing the website in the reference section. The appropriate web site is, http://www.nv.doe.gov/nationalsecurity/homelandsecurity/frmac/manuals.aspx
4/Chapter 1/Section 1.4	I have found that some radiological assessors are unclear whether or not the Intermediate Phase includes the dose from the plume. The 3rd bullet in Section 1.4 states that the Intermediate Phase begins "after the sources and releases have been brought under control (has not necessarily stopped but is no longer growing)" and also states that the Intermediate Phase "may overlap the early phase," Section 2.2 of Chapter 2 states what dose pathways are included in the early Phase and Section 3.2 of Chapter 3 states what dose pathways are included in the Intermediate Phase. Recommend adding a statement to Chapter 3, Section 3.2 that states that the plume pathways dose (inhalation and external exposure from air submersion) is generally not included in the Intermediate Phase dose projections. However in the case of a protracted release that has been brought under control but is still active, the decision makers should consider working with the radiological assessors to include the plume pathways dose in the Intermediate Phase dose projections.
13/Chapter 2/Section 2.1 and Global changes throughout document	The FRMAC Assessment Manual does not use "dose conversion factors" as used in the PAG Manual. To avoid confusion of having PAG Manual users trying to find DCFs in the FRMAC Assessment Manual, recommend the text be changed as follows: "Dose calculations for implementing the PAGs are made using the ~~dose conversion factors (DCFs)~~ Dose Parameters (DPs) and Derived Response Level (DRL) methods referenced in the FRMAC Assessment Manuals ~~(DOE 2010a, b).6"~~
13/Chapter 2/Section 2.2	"Deposited materials can continue to emit beta and gamma radiation as "groundshine" after the plume has passed causing continued exposure to skin and internal body organs." - Per Keith Eckerman (ORNL), some alpha particles are energetic enough to penetrate the dead layer of the skin. This may not be very likely for material deposited on the ground. However to avoid potential

ED_001057_00006709

	inconsistencies, recommend rewording as, “Deposited materials can continue to emit “groundshine” (e.g., beta and gamma radiation) after the plume has passed causing continued exposure to skin and internal body organs.”
15/ Chapter 2/Table 2-1	The header of the first column of Table 2-1 is “Protective Action Response” and the header of the first column of Table 2-1 is “Protective Action Recommendation.” The names of these column names should be consistent.
18/ Chapter 2/Section2.3.3	Can the discussion of the risks of evacuation be updated with data from Hurricane Katrina?
19/ Chapter 2/Section 2.3.4	The FDA recommendations may be clearer to the reader if it was placed in a table.
22/ Chapter 2, Section 2.4.1	I have noticed that many people are confused about the avoidable versus unavoidable dose concept. The current text does not include the term “avoidable dose.” The text should state that dose projections for public protection decisions should be based upon the dose that can be avoided (i.e., avoidable dose) by taking some protective action (e.g., evacuation, sheltering). Recommend adding the following sentence between the 2nd and 3rd sentences of the 1st paragraph of Section 2.4.1 to clarify this issue. “Public protection decisions should be based upon the dose that can be avoided (i.e., avoidable dose) by taking some protective action (e.g., evacuation, sheltering).”
24/ Chapter 2/Section 2.4.3	The term “Dose Conversion Factor (DCF) is used. To avoid confusion with the terminology used in the FRMAC Assessment Manual, recommend the following changes: ~~“… A Dose Conversion Factor (DCF) is any factor used to change an environmental measurement to dose in the units of concern. Depending on the exposure pathway, other factors besides the DCF may be required to convert an environmental measurement into a dose.”~~ Depending on the exposure pathway, many factors such as ground roughness, weathering and resuspension may be required to calculate the Dose Parameter (DP) that converts an environmental measurement into a projected dose over a given time period (e.g., Early Phase). “The FRMAC Assessment Manuals ~~(DOE 2010a, b)~~[14] provide guidance in calculating DRLs and DPs ~~DCFs~~ based on the ICRP dosimetry models (ICRP 60 series).
33/ Chapter 2/Key Points	Change the following text as shown below: “Dose calculations for PAGs are made using the ~~DCF~~ DP and DRL calculation methods referenced in the FRMAC Assessment Manuals. Emergency response organizations are encouraged to use the most current, applicable tools and methods for implementing the PAGs.”

35/ Chapter 3/Section 3.3	Consider adding reference to the FRMAC Assessment Manual as follows: "In most scenarios, relocation decisions will be based on doses from whole-body and internal exposure from inhalation of resuspended contamination. Food and milk ingestion dose should be considered separately with decisions based on the FDA PAGs.[21] The FRMAC Assessment Manual provides guidance in calculating Ingestion Derived Response Levels that indicate the levels of deposited radioactive materials that may result in food exceeding the FDA PAGs."
40/ Chapter 3/Section 3.4.2	Recommend the following change to the first sentence of Section 3.4.2, "The FRMAC Assessment Manuals provide detailed guidance for dose projection and calculating DRLs and ~~DCFs~~DPs (DOE 2010a, b)."
40/ Chapter 3/Section 3.4.2	Near the end of the 2nd paragraph of Section 3.4.2 the discussion of the Strontium-90 RDD infers the need for a skin dose PAG. The PAG Manual no longer has a skin PAG. I'm not sure what the correct solution is but, there seems to be a disconnect here.
46/ Chapter 3/Section 3.7.2	The paragraph that starts, "As part of the U.S. response…" seems to be out of context and doesn't really belong in the PAG Manual. However, if you choose to keep this paragraph, the following statement may be misstated. "DOE's Argonne National Laboratory scientists utilized the RESRAD-RDD tool and hand calculations to approximate the NPP radionuclides." I don't believe RESRAD –RDD was used "to approximate the NPP radionuclides." Wasn't RESRAD-RDD used to estimate the dose from the NPP radionuclides from various activities?
48-49/ Chapter 3/Section 3.8	Recommend not including graphs and tables of specific data unless the text makes clear that these are examples. Including graphs and tables tends to *lock* this data and the readers think that it is always appropriate. The fact is the these data points are frequently updated by changes in dose coefficients, various factors and methods, and this will likely make these graphs and tables quickly obsolete.

OHIO DEPARTMENT OF PUBLIC SAFETY
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Nancy J. Dragani
Executive Director

Emergency Management Agency
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www.ema.ohio.gov

TO: United States Environmental Protection Agency

FROM: Michael L. Bear, Radiological Branch Chief, Ohio Emergency Management Agency MLB

CC: Utility Radiological Safety Board of Ohio
Utility Radiological Safety Board of Ohio Working Group

DATE: June 24, 2013

RE: Comments on Protective Actions Guidance Manual (Docket ID No. EPA-HQ-OAR-2007-0268)

Per the Federal Register announcement of April 15, 2013 I am submitting comments on the revisions to the Protective Action Guidance Manual on behalf of my agency.

- On page 41 the PAG manual refers the reader to the 1992 PAG Manual to see calculations related to the calculation of the ingestion phase limits of 2 REM for the first year limit and 05 REM for subsequent years. Adding these calculations to the new PAG Manual as an attachment or appendix would capture the related information in a single place for ease of use.

- On page 42 the PAG Manual states that radionuclide limits have been determined under the Safe Water Drinking Act (SWDA). Including the applicable portions of the SWDA in an appendix or attachment would be helpful to the reader.

  The EPA should also reconsider the decision not to develop a PAG specifically for drinking water. While the standards laid out in the SDWA and the National Primary Drinking Water Regulations (NPDWR) for Radionuclides may be appropriate for a lifetime exposure calculations, they aren't easily adaptable to emergency situations. The contention that alternate sources of clean water can be obtained and shipped to an area assumes the infrastructure around the affected area is intact. The Fukushima accident demonstrated that areas affected by the radiological emergency could suffer severe infrastructure challenges and that outside sources of water and supplies may not be available. In order to cover all contingencies it would be prudent to have a drinking water PAG developed so we can advise people who only have contaminated drinking water available.

  The focus of the water discussion in the PAG manual is on public water systems. Is this because the EPA does not have jurisdiction over private water sources? If a different federal agency has responsibility for private water sources, have they developed a PAG that could be applied to public water systems if EPA does not develop a drinking water PAG?

- Section 4.6.1 on page 55 provides an example of the late phase following an incident based on a radiological dispersal device (RDD) scenario. This scenario assumes the federal government will be the source of funds for the recovery effort. An example based on a nuclear power accident with a discussion of the fiscal roles played by the utility, American Nuclear Insurers (ANI), and the federal government would be helpful.

- Page 58 of the PAG manual discusses the establishment of technical and stakeholder working groups to advise/concur with proposed clean-up actions. Assuming a nuclear power plant accident, does the guidance envision including utility representatives in these working groups?

Updates to Protective Action Guides Manual: Protective Action Guides (PAGs) and Planning Guidance for Radiological Incidents

[EPA–HQ–OAR–2007–0268; FRL–9707–2]

Comments from the Health Physics Society
June 22, 2013

General Comments

The Health Physics Society is pleased to see the publication of the updated Protective Action Guides (PAG) Manual as it applies to different types of radiation emergencies, including acts of terrorism. This long-awaited update to the 1992 version is thorough and clear. The document will be helpful to emergency planners and will be helpful in radiation emergency drills and exercises. The updated dosimetry to ICRP 60, references to the 2009 DOE Operational Guidelines, and the discussion of various waste disposal options all represent useful updates.

The Society would like to highlight two particular issues for improvement. First, the PAG Manual does not include any specific guidance for drinking water for short-term application during an emergency. Instead, the Manual seeks public comment on this issue. The Society is disappointed because the events that unfolded after the Fukushima Daiichi nuclear power plant accident in Japan highlighted the importance of having specific, practical guidelines for drinking water in short-term radiation emergency situations.

Second, the PAG Manual uses the outdated traditional radiation units to communicate the PAGs, and international units are given in parentheses. The Society supports the *exclusive* use of the International System of Units (SI Units) to express radiological quantities.[1] In fact, the National Institute of Standards and Technology (NIST) continues to strongly discourage the use of the old radiological units in the United States. [2] All international organizations and many U.S. organizations such as the National Council on Radiation Protection and Measurements (NCRP) have stopped using the outdated units. Of particular interest, most print and television media in the United States, reporting on the 2011 disaster in Japan, used the current international system of units in their reporting. In case of a radiation emergency in the United States, communication with the public and our international partners and the media will already be challenging. The continued use of outdated units to express radiological

[1] HPS Position Statement 025, "Exclusive Use of SI Units to Express Radiological Quantities," (Feb 2012). http://hps.org/documents/SIunits_ps025-0.pdf

[2] National Institute of Standards and Technology. Metric system of measurement: Interpretation of the International System of Units for the United States. Federal Register 63:40334–40340; 1998.
National Institute of Standards and Technology. The International System of Units (SI). Gaithersburg, MD: National Institute of Standards and Technology; Special Publication 330; 2008a.
National Institute of Standards and Technology. Guide for the use of the International System of Units (SI). Gaithersburg, MD: National Institute of Standards and Technology; Special Publication 811; 2008b.

quantities can have significant repercussions with regard to communication and effective response to radiation emergencies.

The Environmental Protection Agency can use the updated PAG Manual as an opportunity to help our country make the inevitable transition to exclusive use of SI units for radiological quantities. At a minimum, the standard international units should be given first with the outdated units in parentheses.

Specific Comments

Scope - Even though the following points are already stated in the document, it would be helpful to highlight them to avoid misunderstanding or misrepresentation of the PAGs:

- PAGs are for use only in emergencies.
- PAGs are not legal radiation limits, and do not supersede any environmental laws or regulations.
- PAG recommendations do not represent the boundary between safe and unsafe conditions.

Section 2.3.2 – In the bulleted list describing when it is appropriate to shelter-in-place, include the IND incident.

Section 2.3.3 – This section is titled “Considerations for Evacuation and Sheltering in Place” and yet all but the last paragraph is about evacuation. The last paragraph talks about effectiveness of structures as shelters but only as it relates to using them as collection points during evacuation. The title of this section should be revised to “Considerations for Evacuation.” Another section titled “Considerations for Sheltering In Place” would be helpful to discuss the importance of sheltering particularly for an IND incident. It would also be helpful in that new section to include more discussion related to Figure 2-1.

Section 2.4.2 – This section emphasizes an incident at a fixed facility. The section could benefit from an expanded discussion to include RDD and IND scenarios.

Section 2.7 – In the last paragraph of this section, it would be helpful to leave some allowance for incidents such as an IND incident when there is a large number of injuries and saving lives or limbs take precedence over contamination issues. Ambulances and other equipment may have to be used although they are contaminated above twice background.

Table 3-1 – While the PAG (Projected Dose) entry in the first row is clear, the entry for the second row <2 rem (20 mSv) does not specify if it is for the first year, the second year, or life-time?

Table 3-1 – A footnote a makes a reference to Section 3.7 to address why these PAGs may not provide adequate protection from some long-lived radionuclides. However, this point is not clear on Section 3.7.

Section 3.5 – For the discussion of PAG for Drinking water, following comments are provided:

- It would be helpful to state that the values established under the Safe Drinking Water Act are based on 70-year lifetime consumption of water at those concentrations.
- The document says in multiple sections that “the Agency recognizes a short-term emergency drinking water guide <u>may</u> be useful for public health protection” in a radiation emergency.

[emphasis added] The fact is that a short-term emergency guide is an absolute necessity in a radiation emergency that impacts sources of drinking water. Lack of such guidance may cause undue concern for the public.

- For drinking water interdiction during the intermediate phase of a radiation emergency, the 5 mSv projected dose in the first year, suggested by the Department of Homeland Security in 2008 is a useful guidance.[3] However, a guidance which is based on a shorter duration of consumption will also be useful and practical.

Section 3.7 – Reentry during Intermediate Phase - it would be helpful to mention that stakeholders should be involved in reentry decisions, whenever they occur.

Section 4.1.6. b) The third paragraph states: "*Preliminary remediation activities during the intermediate phase- such as emergency removal, decontamination, resumption of basic infrastructure function and some return to normalcy in accordance with intermediate phase PAGs – should not be delayed for the final site remediation decisions.*" We agree on the importance of this principle, and believe that it will help in the recovery of local communities and their economy. It would help to highlight this as a Key Point for Chapter 4.

[3] 73 FR 45029 - Planning Guidance for Protection and Recovery Following Radiological Dispersal Device (RDD) and Improvised Nuclear Device (IND) Incidents, August 1, 2008.
http://ogcms.energy.gov/73fr45029.pdf

AMERICAN THYROID ASSOCIATION
FOUNDED 1923

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July 5, 2013

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Environmental Protection Agency
Mail Code: 6102T
1200 Pennsylvania Avenue, NW
Washington, DC 20460

Re: Docket ID No. EPA-HQ-OAR-2007-0268

Dear Sir or Madam:

We are writing on behalf of the American Thyroid Association (ATA) in response to your request for comments (Fed Reg 78 FR 22257, 04/15/2013) regarding the EPA's ***Protective Action Guides (PAG) Manual; Updates: Protective Action Guides and Planning Guidance for Radiological Incidents***. The ATA represents the largest and most established group of physicians dedicated to the study of the thyroid gland and its disorders. The leading worldwide organization dedicated to the advancement, understanding, prevention, diagnosis, and treatment of thyroid disorders and thyroid cancer, the ATA is an international individual membership organization with over 1,600 members from 43 countries around the world.

There are two concerns related to potassium iodide (KI) that we are believe are important and not sufficiently addressed in the current draft of the PAG manual. KI is a safe and effective protective measure against the harmful thyroidal effects of radioactive iodine release.

1. The ATA favors KI predistribution so that KI would be immediately available in the event of a nuclear accident. Sections 2.3.4 and 2.3.5 of the PAG manual should be amended to include the option of predistribution to facilitate timely KI administration. The ATA advocates KI as an essential adjunct to evacuation, sheltering, and avoiding contaminated food, milk, and water.

2. We would note that the 2004 National Academies of Science report (National Research Council *of the National Academies.* Distribution and Administration of Potassium Iodide in the Event of a Nuclear Incident. Washington, DC: The National Academies Press, 2004) discussed KI distribution strategies in detail and is an important reference to cite.

Sincerely,

Bryan R. Haugen, MD
President, ATA

John C. Morris, III, MD
Secretary/COO, ATA

Angela M. Leung, MD
Chair, ATA Public Health Committee

Elizabeth N. Pearce, MD
Board Liaison, ATA Public Health Committee

PILGRIM WATCH COMMENT PAG MANUAL MARCH 2013 DRAFT FOR INTERIM USE AND PUBLIC COMMENT

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July 9, 2013

TABLE CONTENTS

PILGRIM WATCH COMMENT PAG MANUAL (MARCH 2013) DRAFT FOR INTERIM USE AND PUBLIC COMMENT [Docket ID No. EPA-HQ-OAR-2007-0268]

July 9, 2013

I. INTRODUCTION

EPA's Draft PAG provides radiological protection criteria (PAGs and protective actions) for application to all incidents that would require consideration of protective actions, with the exception of nuclear war.

The PAG says that the "PAGs are not legally binding regulations or standards and do not supersede any environmental laws." However state and local responders treat the Manual as the Gospel and this should be recognized.

The Draft PAG Manual should make clear, but does not, what specific regulations or standards require beside the PAG Manual Guidance. A simple table should be included in the final document laying out side by side the PAGs and all other pertinent standards, as opposed to only footnotes providing links to those standards, as in the draft.

The PAG Manual divides into three sections: Early Phase Protective Action Guides; Intermediate Phase Protective Action Guides; and Late Phase Protective Action Guides. EPA's draft largely provides simply a broad-brushed description of radiological emergency plans at each stage; and not enough attention is given to what the plans should be in order to reflect lessons learned from Fukushima and to protect public health and the environment. The EPA Draft Manual guidance is inadequate in the following areas.

- Meteorological plume modeling, real-time offsite radiological air monitors, environmental sampling
- Dose Guidance
- Potassium Iodide
- Cleanup

II. METEOROLOGICAL PLUME MODELING; REAL-TIME OFFSITE RADIATION/METEOROLOGICAL AIR MONITORING STATIONS; ENVIRONMENTAL SAMPLING - EARLY, INTERMEDIATE, LATE PHASE PROTECTIVE ACTION GUIDANCE

The PAG Manual provides radiological protection criteria for application to all incidents that would require consideration of protective actions. In order to make the correct protective action call (evacuate, shelter, administration KI, interdiction of food/milk/water) and properly assess what areas require cleanup and population relocation requires:

- advanced and site-appropriate meteorological plume models;
- the availability of real -time meteorolo gical/radiological monitors located in the near and far field; and
- Timely and reliable environmental monitoring.

The PAG Draft Manual does not, as it should provide proper specific guidance in these three areas.

A. Meteorological Plume Modeling- Outdated Gaussian Model v. Advanced Variable Models

The EPA Draft PAG missed the opportunity to plainly state that advanced meteorological models[1] should be used. The draft dances around the issue but never comes straight out with a definite recommendation, as it should in the final PAG Manual.

a. Today, the out -dated straight-line Gaussian plume is used by licensees and federal/state emergency planners. It will not provide the information required to make correct protective action decisions. The Gaussian plume model assumes that a release d radioactive plume travels in a steady -state straight -line, i.e., the plume functions much like a beam from a flashlight. The choice of a straight -line Gaussian plume rather than a variable trajectory model drastically reduces, to a wedge, the size of th e area that might potentially be impacted by a release. It has been known by government and independent agencies for a long time that the assumption of a steady-state, straight -line plume is inappropriate when complex inhomogeneous wind flow

[1] See Draft PAG at, fr example pgs., 13,21,22,23,24,37,40

patterns happen to be prevailing in the affected region – such as in hilly and mountainous terrain, along rivers that channel the plume and along wide bodies of waters where, for example, the sea breeze effect occurs.

Sea breeze : There is a misconception that the sea b reeze is generally a highly beneficial phenomenon that disperses and dilutes the plume concentration and thereby lowers the projected doses downwind from the release point. However, if the same meteorological conditions (strong solar insolation, low synoptic-scale winds) that are conducive to the formation of sea breezes at a coastal site occurred at a non coastal location, the resulting vertical thermals developing over a pollution source would carry contaminants aloft. In contrast, at a coastal site, th e sea breeze draws contaminants downward across the land and inland subjecting the population to larger doses and at greater distance.

Behavior Plumes over Water : Also Planning should, but does not, reflect understanding of the flow of air over and arou nd large bodies of water. As an example at Pilgrim, located on New England's Coastline, winds initially headed out to sea will remain tightly concentrated due to reduced turbulence over water until the winds blow the puffs back over land. [2] This can lead to hot spots of radioactivity in unexpected places – beyond 10 miles that should be instructed and prepared to take protective actions.

Meteorological Modeling: Government and Independent Studies

EPA has been a leader in advanced meteorological studies. Al so other government and independent studies support that a straight line Gaussian plume model cannot account for the effects of complex terrain on the dispersion of pollutants from a source. Therefore the final EPA PAG should make this clear – not simply ignore or skirt the issue.

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[2] Zager M, Tjernstrom M, Angevine W. 2004, New England coastal boundary layer modelin g. In: AMS 16 th Symposium on boundary Layers and Turbulence, August 2004, Portland, Maine. Angevine WM. Tjernstrom M, Senff CJ, White AB. 2004. Coastal Boundary layer Transport of urban pollution in New England In: 16th Symposium of boundary layers and tur bulence Portland, Maine, 13 th Symposium on Turbulence and diffusion, August 2004, Portland, Maine. Angevine WM. Tjernstrom M, Zager M. 2006. Modeling of the Coastal Boundary Layer and Pollutant Transport in New England, J. of Appl. Meteorol. & Climatol. 4 5: 137-154. Scire JS, Strimaitis DG, Yamatino RJ. 2000 A User's Guide for the CALPUFF Dispersion Model (Version 5). Concord MA: Earth Tech, Inc.

EPA

EPA recognized the need for complex models. For example: EPA's 2005 Guideline on Air Quality Models says in Section 7.2.8 *Inhomogenous Local Winds* that,

> In very rugged hilly or mountainous terrain, along coastlines, or near large land use variations, the characterization of the winds is a balance of various forces, such that the assumptions of steady -state straight line transport both in time and space are inappropriate. (Fed. Reg., 11/09/05).

EPA goes on to say that, "In special cases described, refined trajectory air quality models can be applied in a case-by-case basis for air quality estimates for such complex non-steady-state meteorological conditions." This EPA Guideline also references an EPA 2000 report, *Meteorological Monitoring Guidance for Regulatory Model Applications,* EPA-454/R-99-005, February 2000. Section 3.4 of this Guidance for coastal locations, discusses the need for multiple inland meteorological monitoring sites, with the monitored parameters dictated by the data input needs of particular air quality models.

Most important, EPA's November 2005 Modeling Guideline (Appendix A to Appendix W) lists EPA's "preferred models" and the use of straight line Gaussian plume model, called ATMOS, is not listed. Sections 6.1 and 6.2.3 discuss that the Gaussian model is not capable of modeling beyond 50 km (32 miles) and the basis for EPA to recommend CALPUFF, a non-straight line model.[3]

NRC

Since the 1970s, the USNRC too has historically documented advanced modeling technique concepts and potential need for multiple meteorological towers appropriately located in offsite communities, especially in coastal site regions. But ignored implementing its' own advice.

[3] http://www.epa.gov/scram001/guidance/guide/appw_05.pdf

In 2009, the NRC made a presentation to the National Radiological Emergency Planning Conference;[4] and although it was focused on emergency planning, the content is equally relevant to meteorological modeling for consequence analysis. The presentation concluded that the straight-line Gaussian plume models cannot accurately predict dispersion in a complex terrain and are therefore scientifically defective for that purpose [full presentation is available at ML091050226, ML091050257, and ML091050269 (page references used here refer to the portion attached, Part 2, ML091050257). Exhibit 19

Most reactors, if not all, are located in complex terrains, including Pilgrim. In the presentation, NRC said that the "most limiting aspect" of the basic Gaussian Model, is its "inability to evaluate spatial and temporal differences in model inputs" [Slide 28]. Spatial refers to the ability to represent impacts on the plume after releases from the site e.g., plume bending to follow a river valley or sea breeze circulation. Temporal refers to the ability of the model to reflect data changes over time, e.g., change in release rate and meteorology [Slide 4].

Because the basic Gaussian model is non-spatial, it cannot account for the effect of terrain on the trajectory of the plume – that is, the plume is assumed to travel in a straight line regardless of the surrounding terrain. Therefore, it cannot, for example, "'curve' a plume around mountains or follow a river valley." NRC 2009 Presentation, Slide 33. Entergy acknowledges that within 50-miles from Pilgrim there are hills and river valleys. Further it cannot account for transport and diffusion in coastal sites subject to the sea breeze. Sea breeze also applies to any other large bodies of water. The sea breeze causes the plume to change direction caused by differences in temperature of the air above the water versus that above the land after sunrise. If the regional wind flow is light, a circulation will be established between the two air masses. At night, the land cools faster, and a reverse circulation (weak) may occur [Slide 43]. Turbulence causes the plume to be drawn to ground level [Slide 44].

The presentation goes on to say that, "Additional meteorological towers may be necessary to adequately model sea breeze sites" [Slide 40].

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[4] What's in the Black Box Known as Emergency Dose Assessment (ML091050226), 2. Dispersion (ML091050257), 3. Dose Calculation (ML091050269), 2009 National Radiological Emergency Planning Conference, Stephen F. LaVie

Significantly, the NRC 2009 Presentation then discussed the methods of more advanced models that *can* address terrain impact on plume transport, including models in which emissions from a source are released as a series of puffs, each of which can be carried separately by the wind, (NRC 2009 Presentation Slides 35, 36). This modeling method is similar to CALPUFF. Licensees are not required, however, to use these models in order to more accurately predict where the plume will travel to base either consequence analyses or protective action recommendations.

The NRC recognized as early as 1977 that complex terrain presented special problems that a model must address if the air dispersion analysis is to be accurate.[5] For example: NRC, Regulatory Guide 1.111, *Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light-Water-Cooled Reactors* (July 1977) (Draft for Comment) says that, "Geographic features such as hills, valleys, and large bodies of water *greatly* influence dispersion and airflow patterns. Surface roughness, including vegetative cover, affects the degree of turbulent mixing." (Emphasis added).

<u>This is not new information; knowledge of the inappropriateness of straight-line Gaussian plume in at complex sites goes back a long way within NRC. For example:</u>

1972: NRC Regulatory Guide 123 (Safety Guide 23) On Site Meteorological Programs 1972, states that, "at some sites, due to complex flow patterns in non-uniform terrain, additional wind and temperature instrumentation and more comprehensive programs may be necessary."

1977: NRC began to question the feasibility of using straight line Gaussian plume models for complex terrain. *See* U.S.NRC, 1977, Draft for Comment Reg. Guide 1.111 at 1c (pages 1.111-9 to 1.111-10)

1983: In January 1983, NRC Guidance [NUREG-0737**,** Supplement 1 "Clarification of TMI Action Plan Requirements," January 1983 Regulatory Guide 1.97 - Application to Emergency Response Facilities; 6.1 Requirements], suggested that changes in on-site meteorological monitoring systems would be warranted if they have not provided a reliable indication of monitoring conditions that are representative within the 10-mile plume exposure EPZ.

[5] Ibid

1996: The NRC acknowledged the inadequacy of simple straight -line Gaussian plume models to predict air transport and disper sion of a pollutant released from a source in a complex terrain when it issued RTM -96, *Response Technical Manual,* which contains simple methods for estimating possible consequences of various radiological accidents. In the glossary of that document, the NR C's definition of "Gaussian plume dispersion model" states that such models have important limitations, including the inability to "deal well with complex terrain." NUREG/BR-0150, Vol.1 Rev.4, Section Q; ADAMS Accession Number ML062560259,

2004: A NRC rese arch paper, *Comparison of Average Transport and Dispersion Among a Gaussian, A Two- Dimensional and a Three-Dimensional Model*, Lawrence Livermore National Laboratory, October, 2004 at 2. ("Livermore Report") had an important caveat added to the Report's summary about the scientific reliability of the use of a straight -line Gaussian model in complex terrains:

> . . . [T]his study was performed in an area with smooth or favorable terrain and persistent winds although with structure in the form of low -level noc turnal jets and severe storms. In regions with *complex terrain* , particularly if the surface wind direction changes with height, *caution should be used.* Livermore Report at 72 (Emphasis added)

2005: In December, 2005, as part of a cooperative program betwe en the governments of the United States and Russia to improve the safety of nuclear power plants designed and built by the former Soviet Union, the NRC issued a Procedures Guide for a Probabilistic Risk, related to a Russian Nuclear Power Station. The Guid e, prepared by the Brookhaven National Laboratory and NRC staff, explained that atmospheric transport of released material is carried out assuming Gaussian plume dispersion, which is "generally valid for flat terrain." However, the Guide the caveat that in "specific cases of plant location, such as, for example, a mountainous area or a valley, more detailed dispersion models may have to be considered." *Kalinin VVER -1000 Nuclear power Station Unit 1 PRA, Procedures Guide for a Probabilistic Risk Assessment,* NUREG/CR- 6572, Rev. 1 at 3 -114; excerpt attached as Exhibit 8, full report available at http://www.nrc.gov/reading-rm/doc-collections/nuregs/contract/cr6572. Exhibit 20

2007: NRC revised their Regulatory Guide 1.23, Meteorological Monitoring Programs for Nuclear Power Plants. On page 11, the section entitled *Special Considerations for Complex Terrain Sites* says that, "At some sites, because of complex flow patterns in nonuniform terrain, additional wind and temperature instrumentation and more comprehensive programs may be necessary. For example, the representation of circulation for a hill-valley complex or a site near a large body of water may need additional measuring points to determine airflow patterns and spatial variations of atmospheric stability. Occasionally, the unique diffusion characteristics of a particular site may also warrant the use of special meteorological instrumentation and/or studies. The plant's operational meteorological monitoring program should provide an adequate basis for atmospheric transport and diffusion estimates within the plume exposure emergency planning zone [i.e., within approximately 16 kilometers" (10 miles)].[6]

These excerpts from Regulatory Guide 1.23 demonstrate that the NRC recognizes there are certain sites, such as those located in coastal areas, like Pilgrim, that multiple meteorological data input sources are needed for appropriate air dispersion modeling. Not simply one or two meteorological towers onsite. Since the straight-line Gaussian plume model is incapable of handling complex flow patterns and meteorological data input from multiple locations, Regulatory Guide 1.23 demonstrates NRC's recognition that it should not be used at any site with complex terrain.

DOE

DOE, too, recognizes the limitations of the straight-line Gaussian plume model. They say for example that Gaussian models are inherently flat-earth models, and perform best over regions of transport where there is minimal variation in terrain. Because of this, there is inherent conservatism (and simplicity) if the environs have a significant nearby buildings, tall vegetation, or grade variations not taken into account in the dispersion parameterization.[7]

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[6] For example, if the comparison of the primary and supplemental meteorological systems indicates convergence in a lake breeze setting, then a "keyhole" protective action recommendation (e.g., evacuating a 2-mile radius)
[7] the MACCS2 Guidance Report June 2004 Final Report, page 3-8:3.2 Phenomenological Regimes of Applicability

National Research Council

Tracking and Predicting The Atmospheric Dispersion of Hazardous Material Releases Implications for Homeland Security, Committee on the Atmospheric Dispersion of Hazardous Material Releases Board on Atmospheric Sciences and Climate Division on Earth and Life Studies, National Research Council of the National Academies, 2003. The report discusses how the analytical Gaussian models were used in the 1960s and tested against limited field experiments in flat terrain areas performed in earlier decades.

In the 1970s the US passed the Clean Air Act which required the use of dispersion models to estimate the air quality impacts of emissions sources for comparison to regulatory limits. This resulted in the development and testing of advanced models for applications in complex terrain settings such as in mountainous or coastal areas. In the 1980s, further advances were made with Lagrangian puff models and with Eulerian grid models. Gaussian models moved beyond the simple use of sets of dispersion coefficients to incorporate Monin-Obukhov and other boundary layer similarity measures which are the basis of contemporary EPA models used for both short range and long range transport applications. Helped enormously by advances in computer technologies, in the 1990s, significant advances were made in numerical weather prediction models and also further improve dispersion models through the incorporation of field experiment results and improved boundary layer parameterization. The decade starting with the year 2000 has seen improved resolution of meteorological models such as MM5 and the routine linkage of meteorological models with transport and dispersion models as exemplified by the real time forecasts of detailed fine grid weather conditions available to the public at Olympic events. Computational Fluid Dynamics (CFD) models which involve very fine grid numerical simulations of turbulence and fluid flow began to see applications in atmospheric dispersion studies. The next decade will see routine application of CFD techniques to complex flows associated with emergency response needs.

The nuclear industry does not show evidence of keeping up with these technological advances. For use in modeling air quality concentrations, the NRC uses straight-line Gaussian dispersion algorithms that date back to the 1960s. EPA should, but does not, advocate in the draft keeping up with these technological advances. Complex flow situations such as those associated with flow around high terrain features or that would incorporate sea breeze circulations are not simulated. For emergency response applications, the EPA, unlike NRC, should be advocate of advanced modeling to be installed at nuclear power plants.

Atmospheric Scientists & Meteorologists

For over three decades atmospheric sci entists and meteorologists have been identifying problems in the use of models similar to ATMOS for such settings. Example: Steven R. Hanna, Gary A. Briggs, Rayford P. Hosker, Jr., National Oceanic and Atmospheric Administration, Atmospheric Turbulence an d Diffusion Laboratory, *Handbook on Atmospheric Diffusion* (1982)).

The inability of a simple Gaussian plume model to accurately predict air transport and dispersion in complex terrains is such a basic flaw that it is discussed in a textbook for a college - level introductory course in environmental science and engineering (Steven R. Hanna, Gary A. Briggs, Rayford P. Hosker, Jr., National Oceanic and Atmospheric Administration, Atmospheric Turbulence and Diffusion Laboratory, *Handbook on Atmospheric Diffusion* (1982)). (Chapter 13 authored by William J. Moroz). In listing the assumptions that are made to develop a simple straight line Gaussian plume model, the textbook warns that:

The equation is to be used over relatively flat, homogeneous terrain. It should not be used routinely in coastal or mountainous areas, in any area where building profiles are highly irregular, or where the plume travels over warm bare soil and then over colder snow or ice covered surfaces

B. Real-Time Offsite Radiation/Meteorological Air Monitoring Stations

The EPA Final PAG needs to emphasize in clear language the need for robust real -time monitoring data to help address the question of what was emitted, over what timeframe, where it went thereafter, and what did it do or not do to the surrounding public. The importance is threefold:

(1) <u>Fore-casting</u> (ahead of time, as a tool for emergency planning tool for pre -planning). Where would a plume likely go under various typical weather regimes, and what and where could be the resultant concentrations/potential doses?

(2) Now-casting (during a radiological emergency). Where is the plume actually going, and what are the resultant concentrations/potential doses - for making appropriate recommendations (i.e., evacuate or shelter in place)?

(3) Hind-casting (the post -radiological emergency timeframe) – Combining meteorological modeling with expanded meteorological/radiological data to provide for more accurate/realistic dose estimates can help with disaster recovery, clean -up, litigation resolution, and short -term acute and long-term epidemiological health studies.

Multiple Meteorological Towers Importance Recognized Since the 1970's

Since the 1970s, the USNRC has historically documented all the advanced modeling technique concepts and pote ntial need for multiple meteorological towers especially in coastal regions. NRC Regulatory Guide 123 (Safety Guide 23) On Site Meteorological Programs 1972, states that, "at some sites, due to complex flow patterns in non -uniform terrain, additional win d and temperature instrumentation and more comprehensive programs may be necessary]; and an EPA 2000 report, Meteorological Monitoring Guidance for Regulatory Model Applications, EPA-454/R-99-005, February 2000, Sec 3.4 points to the *need for multiple inla nd meteorological monitoring sites*. See also Raynor, G.S.P. Michael, and S. SethuRaman, 1979, Recommendations for Meteorological Measurement Programs and Atmospheric Diffusion Prediction Methods for Use at Coastal Nuclear Reactor Sites. NUREG/CR-0936.

C. Environmental Sampling/Monitoring

The Draft PAG recognizes that dose projections are useful for initiating protective actions in the early phase but there is uncertainty prior to confirmatory field measurements because of unknown factors affecting environmental pathways, inadequacies of modeling and uncertainty in the data for release terms. (Draft, pg., 22) However what is not acknowledged are the limits of field measurements due to lack of funds and sufficient staff to perform the field measurements in a timely manner. Also the PAG does not indicate specifics such as how deep in the soil samples should be taken nor how often the samples should be repeated in the same area to account for resuspension or aqueous discharges and runoff.

III. PLANNING GUIDANCE AND PAGS (DRAFT, PG., 7)

Decisions regarding protective actions depend on dose response guidance. Whether the dose-response guidance is based on the best science on radiation health effects available today will determine whether the protective actions are protective of human health. Unfortunately the Draft PAGS are based on old science and out-of-date meaning the public will be harmed unnecessarily not protected.

Pilgrim Watch incorporates herein the testimony in full presented by Dr. Daniel Hirsch, Committee to Bridge the Gap, California. Highl ights of what is wrong with the PAGS and how EPA is abdicating its responsibility to protect public health include, for example:

1. EPA eliminates the existing requirements from the 1992 PAGs triggering evacuation when thyroid or skin doses exceed specified limits.
2. EPA eliminates the existing relocation limit of 5 rem cumulative dose over 50 years, saying it might conflict with their long -term cleanup approach, which in the new associated guidance from NCRP would allow cumulative 50 -year doses of 100 rem, twenty-fold higher. Even thirty years exposure at the 2 rem/year figure would, by EPA's own official risk estimates, result in an excess cancer in every eighth person exposed ; orders of magnitude higher risk than EPA has ever considered acceptable.
3. EPA incorrectly argues that relaxed long-term standard is somehow justified because the public's exposure will not be for 70 years. But this is a disingenuous argument. The core of the long-term cleanup part of the PAGs is setting a very high permissible annual dose that one would be allowed to get for a whole lifetime (indeed, the standard 70 year lifetime assumption) without the government having to cleanup at all. The one-year exposure is for the intermediate phase; the long-term phase is forever, and that is what is so troubling about relaxing long-term cleanup standards.
4. EPA says that the Safe Drinking Water Act Maximum Contaminant Limits (MCLs) may not be appropriate and propose five alternatives far more lax , and does so in footnotes. Those proposed weaker l imits would allow concentrations of radionuclides in drinking water orders of magnitude higher than considered safe by EPA under the Safe Drinking Water Act. I have attached two tables Dr. Hirsch put together comparing these levels for four key radionucli des. Their proposals are frequently as bad as the Bush water PAG

proposal and in some cases worse. Generally, they are proposing allowing hundreds to tens of thousands of times higher concentrations of radioactivity in drinking water than EPA has historically allowed as safe under the Safe Drinking Water Act.

Obama Drinking Water PAG proposals vs. Existing EPA Safe Drinking Water Levels and Bush Administration PAG Proposal
units = Bq/L

Radionuclide	EPA Safe Drinking Water Act Maximum Contaminant Limit (MCL)	Bush Proposed Drinking Water PAG	Obama Proposed Drinking Water Page Alternative I (EPA 2013 fn 26)	Obama Proposed Drinking Water PAG Alternative II (EPA 2013 PAG fn 25)	Obama Proposed Drinking Water PAG Alternative III (EPA 2013 PAG fn 27)	Obama Proposed Drinking Water Alternative IV (EPA 2013 PAG fn 24a)	Obama Proposed Drinking Water Alternative V (EPA 2013 PAG fn 24b)
Iodine-131	0.111	314	314	3000	170	10	300
Strontium-90	0.296	246	246	200	160	10	
Cesium-137	7.4	503	503	2000	1200	10	
Plutonium-239	0.555	27	27	50	2	1	

Factors by Which Obama Drinking Water PAG Proposals Would Exceed Existing EPA Safe Drinking Water Levels

Radionuclide	Bush Proposed Drinking Water PAG	Obama Proposed Drinking Water Page Alternative I (EPA 2013 fn 26)	Obama Proposed Drinking Water PAG Alternative II (EPA 2013 PAG fn 25)	Obama Proposed Drinking Water PAG Alternative III (EPA 2013 PAG fn 27)	Obama Proposed Drinking Water Alternative IV (EPA 2013 PAG fn 24a)	Obama Proposed Drinking Water Alternative V (EPA 2013 PAG fn 24b)
Iodine-131	2829	2829	27027	1532	90	2703
Strontium-90	828	828	676	541	34	
Cesium-137	68	68	270	162	1.35	
Plutonium-239	49	49	90	3.6	1.8	

Note: Second vertical column, "Obama proposed Drinking Water Page" should read PAGs not Page

5. EPA incorporates 1998 guidance allowing extremely high contamination of food, despite internal EPA criticism of doing so which said it would produce a cancer in every fiftieth person so exposed.
6. EPA incorporates the DHS PAGs for dealing with long -term cleanup from a nuclear weapons explosion and applies it to any kind of release. The DHS PAG is based on "optimization" and contemplated permitting long -term doses as high as several rem per year. The new PAG is tied to the NCRP new guidance which would allows doses up to 2 rem per year over a lifetime (the equivalent of about 1000 extra chest X-rays every year, or 3 X-rays every day of your life from birth to death). EPA's estimate of a 70 -year

lifetime exposure at that level would be one in every six people exposed would get a cancer (the risk coefficient they use is different for exposure over a lifetime than for earlier years because of the elevated risk at younger ages

7. The associated NCRP guidance on implementing the PAGs for long term cleanup recommends radionuclide concentration levels so high that they would allow concentrations for strontium-90, for example, hundreds of thousands of times higher than the EPA's official Preliminary Remediation Goals for the same exposure scenarios. They would produce cancer risks using EPA's risk figures in the several cancers per ten people exposed, orders of magnitude outside the long-held acceptable risk range.
8. In essence, the PAGs and the documents associated with them are saying nuclear power accidents could be so widespread and produce such immense radiation levels that the government would simply abandon most cleanup obligations and force people to live with exposures so high that extremely large fractions of the exposed population would get cancer from the exposure.
9. Troubling in a different fashion, EPA buries the "bad stuff" in footnote references to a whole series of other documents so it is hard for a lay reader to see the troubling things EPA has done. EPA thereby has made the PAG manual itself essentially useless in a real accident. It was supposed to be a stand-alone, clear document that a first-responder could take off the shelf, look up a table in it, see if a radiation level exceeded a PAG and if so undertake the protective action described therein. But all of that is now removed from the PAG document. Instead, there are footnotes to URLs for numerous referenced documents, most of which are contradictory, so that the PAG does not achieve its intention that is to be useful in providing some guidance.

Furthermore, EPA is statutorily mandated to produce the PAGs and other radiation guidance for the rest of the federal family and historically has viewed DOE and NRC as not sufficiently protective in radiation matters. The PAG now abdicates EPA's responsibility to come up with guidance and instead references almost exclusively documents from DOE that EPA has historically opposed. For example, it now directs the use of DOE's Operational Guidance document which uses cleanup concentrations hundreds of thousands of times higher than EPA's official concentrations. Rather than use its own conversions from conce ntration to risk, EPA now defaults to DOE's models, documents, and values with which it has long disagreed as technically not defensible and not sufficiently protective. But at the end of the day, no emergency responder will have a Protective Action Guide that is useable. If it were used, however, it would allow doses to the public so far outside the range ever considered acceptable as to be deeply disturbing.

IV. EARLY PHASE PROTECTION ACTION GUIDANCE

The Draft PAG's guidance is insufficient or incorrect for: dose that triggers evacuation, discussed above; potassium iodide; omission of the importance of stockpiling 3-M face masks; and apparent confusion over the requirement for, and role of, Reception Centers.

Potassium Iodide, KI (Draft Section 2.3.4)

KI is FDA approved: It is stockpiled around the world and recommended by experts such as: the World Health Organization; the National Academies of Sciences[8] that acknowledged KI's efficacy and that it may be necessary beyond 10 -miles; American Thyroid Associati on; the International Atomic Energy Agency; President Carter's Kemeny Commission; Federation of American Physics; U.S. Public Interest Group. Although adverse reactions are possible, but rare, to those allergic to iodine; however, unlike exposures to radia tion, no long term negative effects or fatalities are on record.

Contrary to FDA and the above listed organizations, the EPA PAG improperly blows out of proportion KI's supposed contraindications, indicating a strong bias to discourage its use – politics over science. For example, EPA says that:

> Some people should not take KI . As a rule, individuals with known allergy to iodine or with pre-existing thyroid disease (e.g., Graves' disease, thyroid nodules, Hashimoto's thyroiditis) that might predispose th em to adverse reactions should avoid KI. (Draft, pg., 20)

FDA, in contrast, says that individuals with known allergy to iodine or with pre-existing thyroid disease should be treated with caution; EPA says that they "should avoid KI.

[8] *Distribution and Administration of Potassium Iodide in the Event of a Nuclear Incident*, 2004

KI-Time Sensitive: The Draft EPA Guidance avoided to make clear[9] that because KI is time sensitive, it must be stockpiled ahead of time and taken so that it can be administered at the earliest possible time. The Final PAG needs to correct this omission.

Distance to Stockpile K I: The Draft makes no recommendation or mention of the distance from reactors that KI should be stockpiled. The Bioterrorism Act's Section 127, for example, called for stockpiling KI out to 20 miles from a reactor site. It was never implemented for purely political reasons despite the fact that NRC stockpiles KI for its employees.

The reason to provide KI in the 10 -20 mile zone is because of the possibility of inhalation during an accident of significant consequence. For example, Dr. Temeck (FDA representa tive to NRC's KI Core Group Meeting, Tempe Arizona, March 4, 1999) stated that exposure to children after Chernobyl resulted from "a combination of inhalation and ingestion."

NRC's NUREG-1633 points out that radioactive iodide can travel hundreds of mil es on the winds. An increase in cancer caused by Chernobyl was detected in Belarus, Russia and Ukraine. Notably, this increase, seen in areas more than 150 miles from the site, continues to this day and primarily affects children who were 0-14 years old at the time of the accident…the vast majority of the thyroid cancers were diagnosed among those living more than 31 miles from the site. The 2001 figures showed 11,000 thyroid cancers at 31 miles. Again, "Exposure to children after Chernobyl resulted from "a combination of inhalation and ingestion."

NRC's NUREG/CR 1433 said that for children, the following dangers might occur from the inhalation of nuclear materials after a massive core-melt atmospheric accident (like Chernobyl):

Approximate Dangers of a Core-Melt Atmospheric Accident for Children

Distance in Miles	Mean Thyroid Dose (rem) for Exposed Children Outdoors*	Probability of Thyroid Damage to Exposed Children Located Outdoors if not Protected by Stable Iodine (like KI)
1	26,000	100%
5	11,600	100%

[9] See Draft PAG, for example, at pgs19-20, 33

10	6,400	100%
25	2,200	80%
50	760	26%
100	200	7%
150	72	2%
200	32	1%

Therefore EPA's Final PAG should advocate stockpiling KI to at least 20 miles, and that both the Federal Government [10] and states have KI stockpiles located so as to provide KI in a timely manner to those without it.

Pilgrim Watch incorporates in full the comments on Potassium Iodide submitted on this docket by Peter Crane, Seattle Washington.

Face Masks

The PAG says that "breathing air filtered through common household items (e.g., folded handkerchiefs or towels) may help reduce exposures from contamination on the ground. (General Guidance for Evacuation and Sheltering in pace, pg., 17) Instead, PW recommends that the Final EPA PAG recommends stockpiling face masks in public shelters, schools; and that emergency planners include face masks in their public education literature. The PAGs advice is not practical for school children and the rest of the public for that matter. Imagine a mother leaving a shelter with two small children to drive to the Reception Center for monitoring, decontamination and relocation instructions. How possibly can she drive and cover her and her children's mouths? Also, masks may be useful inside shelter locations, because shelters cannot be 100% effective in eliminating dose. The basic 3-M (N-95) type masks screen out >0.1 microns and are inexpensive. They come in child and adult sizes.

[10] The U.S. Strategic National Stockpile stopped purchasing KI (Washington Post, April 7, 2011)

Reception Centers- Monitoring & Decontamination

Section 2.31 says that "A decontamination Station, with simple decontamination actions, may need to be collocated at shelters during the pre-evacuation period." The language is confusing for reactor accidents. Radiological emergency plans for nuclear reactors require Reception Centers located outside the EPZ. NUREG-0654, J-12 says that Reception Centers <u>shall</u> monitor 100% of the population within 12 hours. Therefore the Reception Centers must be equipped with sufficient monitors (portal and hand monitors), have capability to decontaminate as required, and provide towels and clothing or coveralls for the public to wear after decontamination. The Final PAG must make this clear.

Similarly, Radiological Emergency Workers Monitoring and Decontamination Stations must be located outside the EPZ and equipped to monitor and decontaminate.

Vehicles arriving at the Reception Centers or REWMDS also must be wiped down so as not to spread contamination to clean areas. The PAG is silent on REWMDS.

V. <u>INTERMEDIATE PHASE (CHAPTER 3)</u>

The Draft says that "The principal protective actions for reducing exposure of the public to deposited radioactive materials are relocation, decontamination and time limits of exposure."

A. Relocation

The Draft says that relocation should be based on 2 rem (2,000 millirem) over the first year of exposure and after the first year, the PAG relocation standard is 0.5 rem (500 millirem). (Draft, pgs., 7, 50)

The PAG **eliminates the existing relocation limit of 5 rem cumulative dose over 50 years, saying it might conflict with their long-term cleanup approach**, which in the new associated guidance from NCRP would allow cumulative 50-year doses of 100 rem, twenty-fold higher. <u>Even thirty years exposure at the 2 rem/year figure would, by EPA's own official risk estimates, result in an excess cancer in every eighth person exposed</u>; orders of magnitude higher risk than EPA has ever considered acceptable

B. Decontamination & Cleanup

The key points to reduce exposure of the public in both the intermediate and late phase are not properly addressed. They include, for example:

- Meteorological modeling with expanded meteorological/radiological data to provide for more accurate/realistic dose estimates that can help with disaster recovery, clean-up (discussed in the foregoing);
- Capability to decontaminate - hosing buildings and plowing under fields does not decontaminate but simply moves the contamination from one place to another;
- Waste disposal, admitted to be impossible in a severe reactor accident but shifting responsibility to the state and local community is not the answer, either; and
- Updated dose estimates based on BEIR VII and geared to the most vulnerable -women and small children.
- Avoided is a discussion of what federal agency is in charge and who pays.

DECONTAMINATION/CLEANUP- NOT PROPERLY ADDRESSED

The EPA Draft never challenges current NRC/FEMA assumptions reflected in NRC's consequences models that:

- Underestimates both the size of the area likely to be contaminated, and the extent of contamination.
- Underestimates how long cleanup and decontamination will take.
- Ignores that forests, wetlands, and bodies of water essentially cannot be cleaned up or decontaminated and in turn runoff will re-contaminate cleaned areas.
- Ignores that the technologies needed for cleanup have not even been developed.
- Underestimates the huge volume of waste; and slides over the fact that there are no available disposal options.
- Ignores there is not even a clear-cut cleanup standard -guidance not regulation.
- Assumptions are based on estimates of what is required for nuclear weapon cleanup, rather than the very different problems presented by nuclear reactor accident - micron size and volume.

- Minimizes consequences by assuming a straight-line Gaussian plume model, ignoring aqueous discharges, and ignoring that an accident can persist over many weeks and months.
- Underestimates the time that decontamination will take. Technologies to cleanup have not been developed; current cleanup methods used in Japan and assumed in US models do not work- hosing down buildings and plowing under fields. They are based on nuclear weapons cleanup that is a different from cleanup after a nuclear reactor accident. Many radionuclides, like Cs-137, have long half-lives.

The Contaminated Area

The cost of cleanup fundamentally reflects the size of the area contaminated, and the level of contamination. A year ago, the Japanese press reported that the Fukushima accident contaminated 13,000 square kilometers (an area nearly equivalent to the size of Connecticut (land area and water). The contaminated area extended in all directions and at considerable distance from the site.[11] The Japanese Ministry of Education, Culture, Sports, Science and Technology (MEXT) map showed the spread of radiation from Fukushima across 10 prefectures, including Tokyo and Kanagawa.[12] Also so far as Pilgrim Watch (hereinafter "PW") knows, no one has even attempted to calculate how much of the Pacific Ocean and connecting waters have been contaminated by aqueous discharges and those impacts on the size of the area contaminated, impact on cleanup and human health from consuming fish and seafood.

Beyond "how large an area," is the question of "how contaminated?" The level of contamination in the affected areas depends on both the size of the release at any point in time, and also on its duration. The Fukushima release has continued for months.

The basic lesson to be learned from these simple facts is that any remotely adequate consequence analysis must take into account the very real likelihood of a large level release that

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[11] *Estimated 13,000 square km eligible for decontamination* Asahi.com (Asahi Shimbun), Oct 12, 2011

[12] Mainichi News, http://mdn.mainichi.jp/mdnnews/news/20111007p2a00m0na009000c.html; Gov't radiation info in English http://radioactivity.mext.go.jp/en/

continues for a long period of time and contaminates many thousands of square miles. The EPA Draft and current NRC economic analyses unreal istically limit the duration of the radioactive release, the size of the affected area, and the radiation source.

- Duration: The Fukushima disaster persisted over many months. But the EPA Draft and NRC approved consequence code, MACCS2, limits the total d uration of a radioactive releases to no more than four (4) days, if the user chooses to use four plumes occurring sequentially over a four day period.[13] A longer release such as that at Fukushima will cause offsite consequences that will increase contamination, and result in required re -decontamination, and significantly increase cleanup costs and the overall cost-benefit analyses.
- Size of Affected Area. How large an area will be contaminated, and where that area is likely to be, depends on assumptions made about the radioactive plume. Fukushima showed that the plume did not travel simply in a straight -line.[14] Fukushima also showed that releases can extend for weeks and months and thereby the plumes will travel in variable directions. Rascal also assumes a Gaussian plume in the near field and a segmented Gaussian plume in the far field. This ignores that winds are co mplex and variable near large water bodies, along rivers, and hilly terrain so that a much larger geographic area, in multiple directions, is impacted. EPA needs to incorporate these lessons in the final PAG.
- Non-Atmospheric Releases. Fukushima also showe d that contamination is also spread by aqueous discharges. In Japan enormous quantities of contaminated water flowed into the Pacific Ocean as result of "feed and bleed" and from runoff into groundwater, streams and other water bodies from contaminants deposited by atmospheric releases on land.
- What Can't Be Cleaned -up? Lessons learned from Fukushima show that forests, water and shorelines, for example, cannot realistically be cleaned up and decontaminated. For example the Japan Times reported in September 2011[15] that

> In August, the government acknowledged difficulties in removing soil and ground cover from the forests, due mostly to the volume of radioactive waste that would be generated by the effort.

[13] NUREG/CR-6613 Code Manual for MACCS2: Volume 1, User's Guide, 2-2
[14] Gov't radiation info in English http://radioactivity.mext.go.jp/en/
[15] Institute probing radioactive contamination of Fukushima forests, Japan Times,, Sep. 17, 2011

> "Huge volumes of soil and other (contaminated) items would be involved because the forests occupy a huge area."
>
> The government effectively shelved any approach to decontaminating forests when it said that removing both the contaminated soil and compost materials would strip the forests of important ecological functions, including water retention.

Real world experience also shows that bodies of water, such as the Pacific, cannot be cleaned up either. Further, ocean currents may re-circulate the contamination for years contaminating and re-contaminating beaches and marine life increasing costs from a continuous need to cleanup and pay for damaged to the environment[16].

Waste Volume and Disposal

Lessons learned from Fukushima show that the Japanese Environment Ministry expects the cleanup to generate at least 100 million cubic meters (130 million cubic yards) of soil, enough to fill 80 domed baseball stadiums. [17]. The Yomiuri Press reported that disposal sites refuse to accept 140,000 tons of tainted waste. [18] Because there is no available storage for the high volume of waste and no community willing to host the disposal site,[19] waste is piling up and run-off from it contaminates and re-contaminates groundwater and property. [20] The problem cannot be solved soon because the technology is not there and cesium-137 takes 30 years to decay one half-life.[21]

The Japanese Government's clean-up budget for the next two years is $14 billion; the NRC's estimate is nowhere near that.

The Draft PAG passes disposal to the states and local communities; and it assumes that cleanup can be quickly accomplished. After Chernobyl, authorities quit trying to clean-up after 4 years.

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[16] Fukushima's radioactive sea contamination lingers, Andy Coghlan, New Scientist, Sept 30, 2011; Radioactive cesium may be brought back by Ocean in 20-30 years , Tokyo Times, 09.16.11
[17] Ibid
[18] *Daily Yomiuri* - Disposal sites refuse to accept 140,000 tons of tainted waste March 4, 2012
[19] Mainiichi Press, *Residents near Fukushima mountains face nuclear recontamination every rainfall, October 11. 2011*
[20] Ibid
[21] Ibid

There is no excuse for ignoring waste storage, and Fukushima proved (and continues to prove) that latter is a pipe -dream. Even optimistically assuming an available radioactive waste repository, it seems unlikely that there would be a sufficient quantity of transport containers, and many communities will quite certainly object to the millions of tons of hazardous materials being transported through them.

The EPA Draft simply passes the buck. It acknowledges that "incidents that create large volumes of waste from a wide -scale radiological incident would likely overwhelm existing radioactive waste disposal capacity in the U.S." (Draft, pg., 69) Therefore it concludes that, "Following a nuclear incident, the states bear primary responsibility to identify and provide waste management options, including disposal capacity." (Ibid) The Draft incorrectly implies that there can be a solution. It says "safely managing and disposing of radioactive waste will require pre-planning at all levels of government and careful coordination with stakeholders at all stages of the decision-making process." (Ibid) It is time for EPA to pull "their big -boy pants up" and admit there is no solution.

Technologies for Cleanup Not Developed - Current Methods Ineffective

Cleanup methods used in Japan, and assumed in the Draft PAG, do not work. Hosing down buildings and plowing under fields does not remove contamination. It simply moves it to another place, such as the groundwater, to reappear at a later date and require more monies to either start again or bare the cost. For example, plowing will move the radiation to below the root zone for crops or reduce root uptake and food doses to the consumer of such crops. Thus, it cannot be said that the decontamination strategies identified remove the radiation from the environment. Also the fact that cesium is soluble, which means that precipitation events or fire-hosing can actually facilitate cesium binding to structural surfaces or spread it into a community's infrastructure (*e.g.*, sidewalks, gutters, drains, sewer pipes) and ecosystem (*e.g.*, groundwater, streams, lakes, reservoirs).[22] The ability of cesium and other fission products to bind to surfaces is especially pronounced for porous or rough surfaces.[23]

[22] Chanin, D.; Murfin, W. (1996). *Site Restoration: Estimation of Attributable Costs from Plutonium-Dispersal Accidents*, SAND96-0957, DE9601166, Sandia National Laboratories. Original 300-dpi OSTI version available at: http://chaninconsulting.com/downloads/sand96-0957.pdf (10.4 MB), OCR-readable courtesy S. Aftergood, FAS, E-12.
[23] Ibid, 5-8, E-1, E-3, E-4, E-8, E-11

A reasonable question is why the EPA, FEMA, NRC and Japanese authorities assume hosing and plowing under fields is cleanup. The likely, and unacceptable, answer is that the needed technologies for clean up have not been developed - their development is predicted to be decades down the road - and the that cost of actually removing all of the contamination too big to even think about - far more than the $14 billion budgeted through 2014 by the Japanese government. However, the fact that the cost of any real clean -up is unimaginable is no excuse for the EPA to relax standards and allow folks to stay or move back to their communities.

The Faulty Premise of the Clean-Up Model[24]

Cleanup assumptions are based on WASH-1400; and WASH -1400, that in turn, were based on clean up after a nuclear explosion. Cleanup after a nuclear bomb explosion is not comparable to clean up after a nuclear reactor accident and assuming so will underestimate the task.

Particle Size : N uclear weapon explosions result in larger -sized radionuclide particles; reactor accidents release small sized particles. Decontamination is far less effective, or even possible, for small particle sizes. Nuclear reactor releases range in size from a fracti on of a micron to a couple of microns; whereas nuclear bomb explosions fallout is much larger - particles that are ten to hundreds of microns. These small nuclear reactor releases get wedged into small cracks and crevices of buildings making clean up extrem ely difficult or impossible. Further reactors release Cs-137 that are no only small particles but soluble. Cesium particles are capable of ion exchange with sodium and potassium in materials such as concrete and migrate over time into the interior and cannot be washed off. Plutonium on the other hand is insoluble.

Mass Loading: Nuclear weapon explosions result in fallout involving large mass loading where there is a small amount of radioactive material in a large mass of dirt and demolished material. Only the bottom layer is in contact with the soil and the massive amount of debris could be shoveled, swept up with brooms or vacuums resulting in a relatively effective, quick and cheap cleanup that would not be the case with a nuclear reactors fine particulate . The Japanese are learning this the hard way, as those in Chernobyl before had discovered.

[24] Chanin, D.; Murfin, W. (1996). *Site Restoration: Estimation of Attributable Costs from Plutonium-Dispersal Accidents*, SAND96-0957, DE9601166, Sandia National Laboratories. Original 300-dpi OSTI version; NYS000241, December 21, 2011, Pre-filed written testimony of Dr. Francois J. Lemay, NYS Contention 12-C,

Type Radiation Released : In addition, a weapon explosion results in non -penetrating radiation so that workers only require basic respiration and skin protection. This allows for cleaning up soon after the event. In contrast a reactor release involves gamma radiation and there is no gear to protect workers from gamma radiation. Therefore cleanup cannot be expedited, unless workers health shamefully and unethically i s ignored. Decontamination is less effective with the passage of time.

Clean-up Standard

How clean is clean? The cleanup standard will be determined by what seems possible - how much it will cost and what the public will accept - not, as it should, by public health considerations.

> In the United States, a range of one in a population of ten thousand to one in a population of one million excess cancer incidence outcomes is generally considered protective for both chemical and radioactive carcinogenic cont aminant exposures. The range is the regulatory standard generally used in the context of EPA superfund response actions…A similar range risk may not be practically achievable for major incidents that result in the contamination of very large areas. In maki ng decisions about cleanup goals and strategies for a particular event, decision makers must balance the desired level of exposure reduction with the extent of the measures that would be necessary to achieve it, in order to maximize overall human welfare.
>
> While it may take many years to achieve final cleanup levels, a timely return to normalcy, including re -occupancy and viable community, will require a more flexible, iterative and inclusive. (Draft, pg., 53)

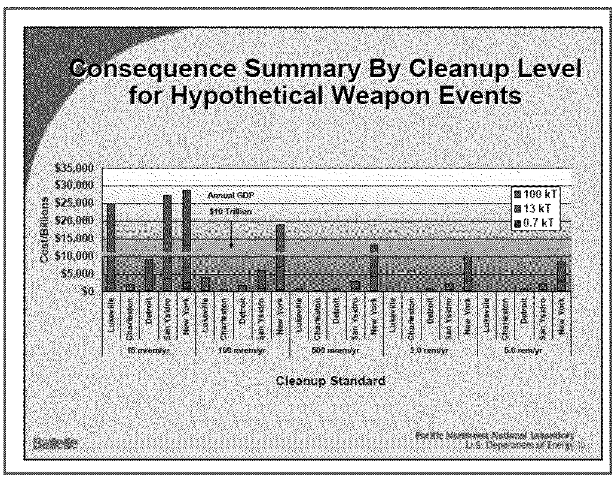
Likewise, firm standards were not pre -set in Ja pan prior to the accident. Real world experience there shows that the public will not tolerate a relaxed standard, unless misled b government agencies. The public expects cleanup to reach pre -accident levels.[25] The same will be true here.

The economic cons equences of a radiological event are highly dependent on cleanup standards and cleanup costs generally increase dramatically for standards more stringent than 500 mrem/yr. This was shown true by two studies commissioned by the US Department of

[25] *In One Japanese City, Hot Spots to Avoid,* Wall Street Journal, Phred Dvorak, Sept 3, 2011

Homeland Security for the economic consequences of a Rad/Nuc attack. Although considerably more deposition would occur in reactor accident, magnifying consequences and costs, there are important lessons to be learned from these studies.

Barbara Reichmuth's study, Ec onomic Consequences of a Rad/Nuc attack: Cleanup Standards Significantly Affect Cost, 2005, [26] Table 1 Summary Unit Costs for D &D (Decontamination and Decommissioning) Building Replacement and Evacuation Costs provides estimates for different types of areas from farm or range land to high density urban areas. Reichmuth's study also points out that the economic consequences of a Rad/Nuc event are highly dependent on cleanup standards: "Cleanup costs generally increase dramatically for standards more stringent than 500 mrem/yr."



A similar study was done by Robert Luna, *Survey of Costs Arising from Potential Radionuclide Scattering Events,*[27] concluded that,

> …the expenditures needed to recover from a successful attack using an RDD type device …are likely to be significant from the standpoint of resources available to local or state governments Even a device that contaminates an area of a few hundred acres (a square kilometer) to a level that requires modest remediation is likely to

[26] Economic Consequences of a Rad/Nuc attack: Cleanup Standards Significa ntly Affect Cost Barbara Reichmuth, Steve Short, Tom Wood, Fred Rutz, Debbie Swartz, Pacific Northwest National laboratory, 2005

[27] Survey of Costs Arising From Potential Radionuclide Scattering Events, Robert Luna, Sandia National laboratories, WM2008 Conference, February 24-28, 2008, Phoenix AZ

produce costs ranging from $1 0M to $300M or more depending on the intensity of commercialization, population density, and details of land use in the area." (Luna, Pg., 6)

In essence, the PAGs and the documents associated with them are saying nuclear power accidents could be so widesp read and produce such immense radiation levels that the government would simply abandon most cleanup obligations and force people to live with exposures so high that extremely large fractions of the exposed population would get cancer from the exposure. He re, EPA's Draft PAG totally abdicates its responsibility to protect public health and the environment, not to mention morality.

C. Drinking Water Standard

The Drinking Water Standard is discussed above, Section II.

VII. LATE PHASE (CHAPTER 4)

There is overlap be tween the intermediate and late phase. In essence, the PAGs and the documents associated with them are saying nuclear power accidents , based on real -world experience in Japan, could be so widespread and produce such immense radiation levels that the government would simply abandon current exposure limits finding them not achievable and advise people to live with exposures so high that exposed population would get cancer from the exposure, especially the most vulnerable- fetus, children, women and the sickly.

The Draft PAG acknowledges that clean -up and decontamination is an enormously expensive job, extending over decades, and the volume and toxicity of wastes from a wide -scale radiological incident is likely to overwhelm existing waste capacity in the U.S. (pgs. 60, 61, 69). Therefore they pass responsibility for the impossible task of dealing with the waste to states; although, the federal government, not the states, have responsibility for assuring the safe operations of nuclear reactors and security. The federal agencies blew it and now the states get responsibility for the "orphaned" waste.

Further the EPA Draft PAG, like NRC, fails to acknowledge that the technology for real cleanup does not exist. As explained, hosing down buildings and plowing under f ields does not clean-up or decontaminate.

Last the section makes clear that the fundamental issues of clean up that: (1) neither the EPA, nor NRC , nor FEMA is responsible for clean-up; (2) that the cleanup standards that will determine what clean-up is required (and hence its cost) have not been defined; and (c) that no funding source has been identified. These three core points were identified in an Inside EPA investigative report in 2010- *Agencies Struggle to Craft Offsite Cleanup Plan for Nuclear Power Accidents*, by Douglas Guarino, Associate Editor. The report is available on line [28] or PW can make the report available, including emails obtained by Inside EPA by FOIA. The report says that:

> EPA, the Nuclear Regulatory Commission (NRC) and the Federal Emergency Management Agency (FEMA) are struggling to determine which agency -- and with what money and legal authority -- would oversee cleanup in the event of a large-scale accident at a nuclear power plant that disperses radiation off the reactor site and into the surrounding area.

The FOIA documents indicate that the agencies began discussions in 2009 after NRC informed the other agencies that it does not plan to take the lead in overseeing such a cleanup; and significantly that money in the Price Anderson Act, an industry-funded insurance account for nuclear accidents, would likely not be available. See the documents obtained by *Inside EPA* (Part 1 and Part 2) under the Freedom of Information Act (FOIA, Part 1, July 27, 2010 Draft White Paper, developed by Jeff Blizzard (USEPA).

Until this is resolved – who is in charge, who pays, and what are the cleanup standards- the Final PAG should not be issued.

Who's In Charge – Who Is Responsible?

The Draft PAG Manual makes clear that no federal agency is in charge (section 4.1.6) - "federal departments and agencies may coordinate"(pg., 55); "Under the NRF and NDRF, FEMA may issue mission assignments to the involved federal agencies, as appropriate" (pg., 56) "NIMS was developed specifically for emergency management and may not be the most

[28] http://environmentalnewsstand.com/Environmental-NewsStand-General/Public-Content/agencies-struggle-to-craft-offsite-cleanup-plan-for-nuclear-power-accidents/menu-id-608.html

efficient response structure for long -term cleanup (pg., 57); "Issues that cannot be solved at the IC/UC or Unified Area Command level may be raised with the Joint Field Office (pg., 57); etc. "May" does not coordinate and take responsibility for getting the job done. Consequently without clear delegated authority, the job will drag on and not get done. The longer cleanup takes, probability is increased that resuspension will carry contaminants further afield and at the same time drive contaminants deep in the soil and groundwater.

History-Avoiding Federal Agency Responsibility

Disagreements over what government agency is in charge were documented in an investigative report by Inside EPA in 2010. It showed that:

EPA's Role: According to the Inside EPA investigative report, a July 27, 2010 white paper was never completed amid disagreements between EPA staff over what authority the agency may or may not have to clean up after a nuclear power plant accident. The paper cited Superfund as a possible source of cleanup funding – either through EPA's appropriation-driven Superfund trust fund or the agency's authority to sue parties responsible for contamination under Superfund law. But significantly EPA staff disagree on whether Superfund is applicable to clean up after a nuclear power plant accident, calling into question its viability as both a source of funding and cleanup authority.

Some at EPA contend that "special nuclear material from a nuclear incident" is exempt from the types of toxic releases governed by Superfund, according to the documents. Others suggest that such material is typically commingled with chemicals and other radioactive materials that are covered by the law, meaning EPA would be able to assert its Superfund authority to conduct a cleanup.

In internal e-mails, other EPA staff provides examples of instances where the agency has been involved with cleanups at nuclear power plant sites due to the sites being contaminated with chemicals. But Jean Schumann, a lawyer in EPA's Office of Emergency Management (OEM), criticized suggestions that the presence of chemical contaminants gives the agency the authority to clean up after a nuclear power plant incident. In one August 5 email, Schumann argues it is uncertain whether Superfund law gives EPA such authority when radioactive substances from the accident are commingled with other contaminants. “I think there is enough uncertainty still on what the 'release' exclusion means.”

NRC’s role: Some federal officials previously assumed NRC had authority and would be the lead agency. However, according to the FOIA documents attached, NRC said that it was not the lead agency and tried to “pass the ball” to EPA, suggesting EPA

would be the appropriate agency to lead such an effort. But, as said above, in an August 5, 2010 email, EPA’s Ms. Schumann said that it was uncertain whether Superfund Law gives EPA such authority when radioactive substances from the accident are commingled with other contaminants. In the draft white paper

FEMA’s Role: While NRC and FEMA require nuclear plants to have emergency response plans, it is not clear these plans extend beyond the initial aftermath of an accident or apply to radiation dispersed over large areas, the documents say. The government's emergency response authorities under the Stafford Act, for instance, expire 60 days after an incident, the draft document notes.

U.S. President: A Presidential declaration of an emergency “leads to rather limited financial assistance being made available through FEMA” and a “potentially more useful Presidential declaration of a major disaster” appears limited to “natural events,” the document said.

States Responsibility: It is apparent that because, “waste resulting from a large scale incident would likely overwhelm current disposal capacity” (pg., 60), “[f]ollowing a nuclear accident, the states bear primary responsibility to identify and provide waste management options, including disposal capacity.” (pg., 69)

Stakeholder Involvement: The section talks about opportunities for stakeholder involvement (pgs., 51, 52, 54-56) but it is our understanding that EPA is the only Federal Agency that requires stakeholder involvement. Therefore if EPA has a “say” in this regard, cleanup will take longer; if, on the other hand, EPA remains not the responsible lead party, then meaningful involvement is not guaranteed.

Who Pays Or Where Is The Money Coming From?

Price Anderson: the industry-funded account established under the Price Anderson Act, which Congress passed in 1957 in an effort to limit the industry's liability, would likely not be available to pay for such a cleanup. The account likely could only be used to provide compensation for damages incurred as the result of an accident, such as hotel stays, lost wages and property replacement costs, the documents show, leaving federal officials unsure where the money to pay for a cleanup would come from.

Evidence – Emails Obtained by Inside EPA's FOIA Request

The following excerpt from Stuart Walker' email, EPA, says that "The insurance funds are not used to cover cleanup costs associated with the incident."

Evidence – Emails Obtained by Inside EPA's FOIA Request

The following excerpt from Stuart Walker' email, EPA, says that "The insurance funds are not used to cover cleanup costs associated with the incident."

From:	Stuart Walker/DC/USEPA/US
To:	Charles Openchowski/DC/USEPA/US@EPA
Date:	07/30/2010 06:54 PM
Subject:	Upcoming political level (AA, Administrator, maybe Obama/Biden) exercises emergency and late phase cleanup exercises on Nuclear Power Plant Incident

> Dr. Steve Landry, SOE Support Team, reviewed the draft scenario. Dr. Landry explained that the intent of the scenario is to have significant damage that exceeds the cap of the $10 billion Price-Anderson Act (PAA). Additionally, the location chosen for the scenario event should be neither "worst case" nor "best case," but somewhere in the middle.
>
> An NRC representative stated that the PAA actually has a $12 billion cap, but that it is not really the issue. The PAA is an insurance policy for displaced persons/damage in the event of a nuclear power plant incident. Once the $12 billion has been exceeded, the U.S. Treasury will cover costs for displaced people. However, the Insurance funds are not used to cover cleanup costs associated with the incident. The NRC representative also noted that each licensee is insured for over $300 million. Whether or not D/As could recover the costs allocated towards the cleanup is an open question and would be decided by the courts, but PAA is designed to support the people affected by the accident.

The following except from the July 27, 2010 Draft White paper says that, " NRC also indicated the Price Anderson Act would be unable to pay for environmental cleanup after the nuclear power plant inci dent only for compensation for damages incurred (e.g., hotel stays, replacement costs for property and personal items, lost wages etc.

NRC-FEMA-EPA White Paper:
Potential Authorities and/or Funding Sources for Off-site Cleanup Following a Nuclear Power Plant Incident

Background:

- The Environmental Protection Agency (EPA), the Nuclear Regulatory Commission (NRC), and the Federal Emergency Management Agency (FEMA) began a series of quarterly meetings in 2009 to discuss unresolved concerns regarding off-site environmental cleanup following a nuclear power plant incident.

- NRC recently indicated to FEMA that they would not be taking the lead for off-site environmental cleanup after a nuclear power plant incident. NRC suggested EPA would be the appropriate agency to lead such efforts.

- NRC also indicated the Price Anderson Act would be unable to pay for environmental cleanup after a nuclear power plant incident, only for compensation for damages incurred (e.g., hotel stays, replacement costs for property and personnel items, lost wages, etc).

- FEMA convened a workgroup to discuss the following issues related to nuclear power plant incidents: potential Agency roles (e.g., who would lead cleanup efforts); cleanup authorities; and fund sources.

- Evaluation of language from the *Price-Anderson Act*, the *Stafford Act*, and EPA's previous policies and expectation that the *CERCLA* (Comprehensive Environmental Response, Compensation, and Liability Act) would generally not be used for response actions to address releases from NRC-licensed sites including nuclear power plants, may indicate a potential gap in authority to perform or oversee and fund off-site cleanup following a nuclear power plant incident, depending on the circumstances of the incident and the subsequent declarations of the federal government.

- The Report to Congress from the Presidential Commission on Catastrophic Nuclear Accidents (See Attachment D)[1]: outlines a number of concerns regarding nuclear power plant incidents. The report covers the sourcing of funds under a "Major Disaster," a "Catastrophe," and how to prepare and respond to a "catastrophic disaster."
    - Current plans do not cover "long-duration accidents that have impacts over large land areas".
    - The authority of the Court to award damages does not extend to executive branch powers.

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Deleted: *CERCLA* (Comprehensive Environmental Response, Compensation, and Liability Act), and

Objective:

- Provide current understanding on potential authorities and sources of funding for off-site cleanup following a nuclear power plant incident.

The next except from the July 27, 2010 Draft White paper lays out the potential cleanup authority and funding source of the Price Anderson Act. It essentially repeats what Stuart Walker, EPA, email's said in the first example, "ANI does not cover environmental cleanup costs under their primary insurance policy. It is anticipated that the secondary insurance policy will behave in a similar manner."

Potential Cleanup Authority and/or Funding Source # 1: *Price-Anderson Act*

- Examples of Potential Circumstances Where It May Be Appropriate to Use the *Price-Anderson Act*: In addition to an accident, the nuclear power plant incident may be the result of: theft or sabotage; the transportation of nuclear fuel to a reactor site; or the storage of nuclear fuel at a reactor site.

- Possible Actions under the *Price-Anderson Act*:
  - o Provide financial assistance to utilities operating nuclear power plants that have experienced an incident.
  - o For individuals who have suffered damages:
    - Those who suffered bodily harm, sickness, or disease will receive financial assistance.
    - Evacuees receive property damage and loss expenses as well as living expenses.
  - o Local and State governments can receive financial assistance to assist with evacuations, sheltering, and other immediate response activities.

- Funding Source for the *Price-Anderson Act*:[2]
  - o Under the *Price-Anderson Act*, American Nuclear Insurers (ANI) provides nuclear power plants with financial assurance by creating insurance funding pools under both a primary and a secondary insurance policy.
  - o **Primary Insurance Policy:** Each year, a premium is paid by utilities that operate nuclear power plants – this premium provides offsite private insurance of $300 million.
  - o **Secondary Insurance Policy:** If an incident exceeds the $300 million, each reactor would pay a prorated share of up to $95.8 million. This secondary pool contains approximately $8.6 billion.

- Potential Gap in Covering Off-site Cleanup under the *Price-Anderson Act*:
  - o These funding pools can only be accessed by a federal agency if the federal agency itself has property that has suffered damages during an incident.
  - o ANI does not cover environmental cleanup costs under their primary insurance policy. While not explicitly stated, there is no expectation that the secondary insurance policy will differ in coverage from the primary insurance policy.

Findings:

Potential Authorities and/or Funding Sources for Off-Site Cleanup Following a Nuclear Power Plant Incident

- *Price-Anderson Act:*
  - o ANI does not cover environmental cleanup costs under their primary insurance policy. It is anticipated that the secondary insurance policy will behave in a similar manner.

Further, the following except from the July 27, 2010 Draft White paper from Kathryn Snead, EPA, explains again that there is a gap in authority to perform or oversee and fund offsite cleanup and that, at bullet 3, "NRC al so indicated the Price Anderson Act would be unable to pay for environmental cleanup after a nuclear power plant incident only for compensation for damages incurred (e.g., hotel stays, replacement costs for property and personal items, lost wages, etc.

Kathryn Snead   To all, Please find attached a draft white paper o...   07/27/2010 03:51:39 PM

From: Kathryn Snead/DC/USEPA/US
To: Stuart Walker/DC/USEPA/US@EPA, Charles Openchowski/DC/USEPA/US@EPA, Jennifer Mosser/DC/USEPA/US@EPA, Susan Stahle/DC/USEPA/US@EPA, Lee Tyner/DC/USEPA/US@EPA, Jean Schumann/DC/USEPA/US@EPA
Cc: Lee Veal/DC/USEPA/US@EPA, Jeffrey Blizzard/DC/USEPA/US@EPA
Date: 07/27/2010 03:51 PM
Subject: White Paper on Off-Site Cleanup Following a Nuclear Power Plant Incident

NRC-FEMA-EPA White Paper:
Potential Authorities and/or Funding Sources for Off-site Cleanup Following a Nuclear Power Plant Incident

Background:

- The Environmental Protection Agency (EPA), the Nuclear Regulatory Commission (NRC), and the Federal Emergency Management Agency (FEMA) began a series of quarterly meetings in 2009 to discuss unresolved concerns regarding off-site environmental cleanup following a nuclear power plant incident.

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  - Current plans do not cover "long-duration accidents that have impacts over large land areas".
  - The authority of the Court to award damages does not extend to executive branch powers.

- The following are questions and concerns are unresolved:

DRAFT: DO NOT CITE OR QUOTE *July 27, 2010*

Potential Cleanup Authority and/or Funding Source # 1: *Price-Anderson Act*

- Examples of Potential Circumstances Where It May Be Appropriate to Use the *Price-Anderson Act*: In addition to an accident, the nuclear power plant incident may be the result of: theft or sabotage; the transportation of nuclear fuel to a reactor site; or the storage of nuclear fuel at a reactor site.

- Possible Actions under the *Price-Anderson Act*:
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- Potential Gap in Covering Off-site Cleanup under the *Price-Anderson Act*:
  - These funding pools can only be accessed by a federal agency if the federal agency itself has property that has suffered damages during an incident.
  - ANI does not cover environmental cleanup costs under their primary insurance policy. While not explicitly stated, there is no expectation that the secondary insurance policy will differ in coverage from the primary insurance policy.

The following drafts from NRC-FEMA-EPA White paper: Potential Authorities and/or Funding Sources for Off-site Cleanup Following a Nuclear Power Plant Accident, July 27, 2010, Pg., 3 repeat the same language.

- Funding Source for the *Price-Anderson Act*:[2]
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At 6,

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Potential Authorities and/or Funding Sources for Off-Site Cleanup Following a Nuclear Power Plant Incident

- *Price-Anderson Act:*
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At 17

----- Forwarded by Elizabeth Southerland/DC/USEPA/US on 06/11/2010 12:13 PM -----

From: Stuart Walker/DC/USEPA/US
To: Elizabeth Southerland/DC/USEPA/US@EPA, Davidw Charters/ERT/R2/USEPA/US@EPA, Helen Dawson/DC/USEPA/US@EPA
Cc: Charles Openchowski/DC/USEPA/US@EPA
Date: 06/11/2010 11:57 AM
Subject: Senior management meeting needed to discuss ongoing staff meetings with NRC and FEMA to resolve responsibilities for early, intermediate, and long-term response to nuclear power plant incidents

Hi Betsy,

See attached email from Colby Stanton that began EPA's involvement with NRC/FEMA efforts to clarify how response to a significant release (e.g., Three Mile Island, Chernobyl) from a commercial nuclear power plant (NPP) would be handled.

After 3 meetings with the other Agencies at the programmatic and general counsel staff, both Charles Openchowski and I believe that we need to have a senior level management meeting to discuss EPA's strategy for these efforts.

There are numerous issues that have arisen during these meetings since Colby's initial note, including:

1. Monies collected from nuclear industry to pay out in the event of a "nuclear incident" go to an insurance company for disbursement. It appears the monies may only go for compensating damages (e.g., cost of temporary or permanent relocation, pay for policemen, personal property replacement, etc) and not environmental cleanup.

2. There appears to not be pre-identified source of funding for environmental cleanup. NRC staff anticipates this would be handled by some type of supplemental appropriation.

3. There is a FEMA expectation that EPA would be heavily involved in the environmental response work, possibly as the lead technical agency (think OSC, RPM role). EPA has not previously been major players in NRC exercises for NPP releases.

Charles and I believe we need a senior level management meeting (OSRTI, OEM, ORIA, OGC, and OHS) to discuss:

1. What would be proper role for EPA in these types of events, including the role of each of our primary offices and respective regional counterparts.
   -- There are of resource (FTEs and $'s) implications for EPA's level of involvement both during a real event and during exercises.
   -- There are also policy implications if EPA appears to be endorsing other cleanup approaches even in a remedial contractor role for NPP events, similar to concerns raised regarding the PAGs.

2. Given the current circumstances dealing with the Gulf spill (e.g., questions about who is in charge, is the federal government in control, etc) not inhibiting our flexibility under CERCLA is a key issue. Although possibly not the first choice to take a response action during a NPP incident, EPA should not agree to language that appears to a legal interpretation that inhibits this option.

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To:	Elizabeth Southerland/DC/USEPA/US@EPA, Davidw Charters/ERT/R2/USEPA/US@EPA, Helen Dawson/DC/USEPA/US@EPA
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At 33,

From: Stuart Walker/DC/USEPA/US
To: Elizabeth Southerland/DC/USEPA/US@EPA, Davidw Charters/ERT/R2/USEPA/US@EPA, Helen Dawson/DC/USEPA/US@EPA
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At 36,

From: Kathryn Snead/DC/USEPA/US
To: "Benowitz, Howard" <Howard.Benowitz@nrc.gov>, "Blunt, Kenyetta" <kenyetta.blunt@dhs.gov>, Sara DeCair/DC/USEPA/US@EPA, "DeFelice, Anthony" <anthony.defelice@dhs.gov>, diane.donley@dhs.gov, "Greten, Timothy" <Timothy.Greten@dhs.gov>, grace.kim@nrc.gov, "Milligan, Patricia" <Patricia.Milligan@nrc.gov>, Jennifer Mosser/DC/USEPA/US@EPA, Charles Openchowski/DC/USEPA/US@EPA, Jean Schumann/DC/USEPA/US@EPA, anneliese.simmons@nrc.gov, Susan Stahle/DC/USEPA/US@EPA, Lee Tyner/DC/USEPA/US@EPA, Stuart Walker/DC/USEPA/US@EPA, Jeffrey Blizzard/DC/USEPA/US@EPA
Cc: Lee Veal/DC/USEPA/US@EPA
Date: 05/25/2010 09:57 AM
Subject: EPA-NRC-FEMA Recovery Discussion on Nuclear Power Plant Incidents

To all,

I apologize about the short notice - my fault for taking so long to send this out:

Our next inter-agency discussion on Recovery from Nuclear Power Plant Incidents:
June 3, 2010 from 1 PM - 3 PM
Follows the FRPCC Meeting (with a break for lunch 11:30 AM - 1 PM)
Crystal City Courtyard Marriott
Blue Ridge Shenandoah Conference Room
2899 Jefferson Davis Highway
Arlington, VA 22202

A few action items that were identified during the last meeting:
- Anneliese Simmons, NRC, agreed to provide example text on the insurance exclusion language on cleanup.
- Anneliese Simmons, NRC, agreed to check on what was meant by "clearly identifiable accidents".

At 45

From: "Greten, Timothy" <Timothy.Greten@dhs.gov>
To: Stuart Walker/DC/USEPA/US@EPA, Kathryn Snead/DC/USEPA/US@EPA
Cc: Charles Openchowski/DC/USEPA/US@EPA, Colby Stanton/DC/USEPA/US@EPA, <grace.kim@nrc.gov>, "Benowitz, Howard" <Howard.Benowitz@nrc.gov>, Jean Schumann/DC/USEPA/US@EPA, Lee Tyner/DC/USEPA/US@EPA, "Milligan, Patricia" <Patricia.Milligan@nrc.gov>, Sara DeCair/DC/USEPA/US@EPA, Susan Stahle/DC/USEPA/US@EPA, "Greten, Timothy" <Timothy.Greten@dhs.gov>
Date: 11/30/2009 07:16 PM
Subject: RE: Agenda: EPA-NRC-FEMA Recovery Discussion

Potential Issue - FEMA looking for someone (e.g., EPA, Corps) to run cleanup of public property after nuclear power plant accident
Stuart Walker to: Elizabeth Southerland, Helen Dawson 12/08/2009 02:17 PM
Cc: RobinM Anderson

Betsy, this is a follow-up email about what I mentioned to you in the hall. Last week I, OEM, ORIA, and OGC staff (including Charles) met with FEMA and NRC policy and general counsel staff.

We were meeting to discuss the role of NRC, EPA, and FEMA after a catastrophic release from a nuclear power plant, and how the compensation clauses of the Price Anderson Act might come into play because of the CERCLA definition of "release" (which makes a reference to Price-Anderson in excluding some releases from CERCLA jurisdiction). In Price-Anderson, Congress in essence set up a federally-backed insurance scheme to compensate victims of a nuclear reactor accident (e.g., Three Mile Island).

I had thought that EPA was there to explain why previous policy from the removal program was incorrect in stating EPA could not respond to such releases under CERCLA authority, but rather EPA had authority but generally expected NRC to have authority over such incidents and did not expect to be involved except for possible help requested by NRC and/or state.

I was surprised to find out that NRC did not intend to be involved in the cleanup or Price-Anderson compensation decisions for contamination that was outside the fenceline of the facility. NRC said that the authority for spending the $10 billion insurance dollars that could become available when the Price Anderson Act is triggered would be lie with an Insurance Company. After those funds were gone, they thought EPA might handle the site cleanup.

NRC does not currently know if the $10 billion can only be used for compensation for damages suffered by members of the public, or if it can be used for site cleanup. Also they have not asked the insurance company if they have any plans/guidance on how they will decide to distribute the monies, whether they have contractors lined up to do the cleanup work or would they expect each affected property owner to do the cleanup after getting a claim paid, or how they will answer the question of "how clean is clean" for purposes of either cleanup or determining what is considered contaminated for the purposes of compensation.

We will be meeting together again as a group. NRC intends on finding out answers to the groups question either prior to that meeting or possibly inviting the insurance company to the next meeting.

fyi, attached is the agenda for the meeting. Below is an email from FEMA the night before the meeting that lays out some of the issues.

The one thing I'm reasonably sure about is the cost for a major long-term cleanup would be in excess of $10bil. If either Stafford Act or Superfund are tapped for $$, the bill is going to be so high that Congress will have to appropriate funds--there is no other way this bill will be paid. And getting those funds will be a political decision negotiated the heads of EPA, FEMA/DHS, NRC, Congress, and the White House.

The first deliverable this group should put together is a memo/paper that reads as a guide through this decision making process, explaining the steps and the different decision points. I think it should shy away from trying to toss the funding burden over the fence and say "superfund must do this!" or "Stafford act must do this", and stick to a neutral explanation of what the consequences of each funding action would be (i.e. "[blank] could be funded by CERCLA--the language allows it. However, CERCLA is incredibly underfunded for something like this). A political tool-kit, if you will, that lays out options and tradeoffs.

The second deliverable would be a memo simply explaining the how of administering a long-range cleanup...that is, no matter who pays for it, it will be a join effort. Each of the agencies has a key ability they bring to the table--EPA understands environmental cleanup/remediation, NRC understands the nuclear power industry, and FEMA has longstanding relationships with state/local government, law enforcement, etc. Both in distributing funding and administering a cleanup, all of these skills would be needed (one agency doesn't have the manpower, either in skill sets or sheer numbers, to pull it off). Also, all of the agencies would essentially be robbing peter to pay paul during a cleanup--they simply don't have standby resources for this beyond a thin bench.

See all of you tomorrow morning!

Tim

The above (12/08/09) paragraph 5 -6 says that, "NRC does not currently know if the $10 billion can only be used for compensation for damages suffered by member of the public, or if it can be used for site cleanup. Also they have not asked the insurance company…how they will answer the question of 'How clean is clean' for purposes of either cleanup or determining what is considered contaminated for the purposes of compensation." By the time they wrote the July 27, 2010 Draft, they were clear that ANI only would pay for damages not cleanup, as the preceding emails show.

At 45,

From:	"Greten, Timothy" <Timothy.Greten@dhs.gov>
To:	Stuart Walker/DC/USEPA/US@EPA, Kathryn Snead/DC/USEPA/US@EPA
Cc:	Charles Openchowski/DC/USEPA/US@EPA, Colby Stanton/DC/USEPA/US@EPA, <grace.kim@nrc.gov>, "Benowitz, Howard" <Howard.Benowitz@nrc.gov>, Jean Schumann/DC/USEPA/US@EPA, Lee Tyner/DC/USEPA/US@EPA, "Milligan, Patricia" <Patricia.Milligan@nrc.gov>, Sara DeCair/DC/USEPA/US@EPA, Susan Stahle/DC/USEPA/US@EPA, "Greten, Timothy" <Timothy.Greten@dhs.gov>
Date:	11/30/2009 07:16 PM
Subject:	RE: Agenda: EPA-NRC-FEMA Recovery Discussion

Good evening!

I hope everyone had a good Thanksgiving and made it through Monday.

After reading through the agenda and other notes, I ask that we move the discussion of the Stafford Act to after both Price Anderson and CERCLA have been discussed. Both of the other funding mechanisms should be discussed before we get to the Stafford Act, as both are the appropriate funding avenues before a Stafford Act declaration is made.

That said, I also have a suggestion about what our outcome might be, based on my discussing w/Diane Donnelly today. Please also excuse me if I'm missing key nuances or information here--I might be the newest player in this game.

I'm not sure how much cleaning up after a respectably-size nuclear power plant incident would cost. $50bil? The mechanisms set up by Price Anderson have set up a $10bil pool to pay for certain expenses. After that is exhausted, and for those expenses not covered, what vehicles are available? This is covered under Superfund language...yet my understanding is Superfund is essentially broke, as industry hasn't paid in since the mid 1990s. Likewise, Stafford Act funds are not available until a declaration is issued--and then only in line with what the declaration covers.

The one thing I'm reasonably sure about is the cost for a major long-term cleanup would be in excess of $10bil. If either Stafford Act or Superfund are tapped for $$, the bill is going to be so high that Congress will have to appropriate funds--there is no other way this bill will be paid. And getting those funds will be a political decision negotiated the heads of EPA, FEMA/DHS, NRC, Congress, and the White House.

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See all of you tomorrow morning!

Tim

January 7, 2011

Re: Fw: Price Anderson info
Stuart Walker to: Jeff Maurer 08/11/2010 05:44 PM
Cc: Gilberto Irizarry, Kathy Jones, Lois Gartner, Randy Deitz

We haven't ever spelled this out anywhere. Nor has final cleanup levels been discussed by the FEMA, NRC, EPA workgroup looking at Price Anderson Act issues. So I don't have a clear answer, but here are some of my thoughts.

EPA has said that under CERCLA, and some other environmental laws (e.g., SDWA, CAA, AEA) that 25/100 mrem is not protective. So I don't think we would want to say we would promoting that as a cleanup level. Also, at one point during the DHS PAG (guidance for dirty bombs and nuclear weapons) development process NRC said they wanted a final cleanup level of 1 to 10 rem (that is 1,000 mrem to 10,000 mrem) and they wanted to apply those cleanup numbers to nuclear power plant meltdowns. I am not sure if NRC still feels the same way now.

In some of the AA level (OAR, OSWER, OW, OGC) which were followed up by Gina MCcarthy of OAR meeting with Lisa Jackson, it was decided we would NOT be using optimization in the ORIA PAG (Protective Action Guidelines) that would be proposed for final cleanup. We would instead be talking about using existing standards. Since this language still has too be drafted it is not certain if/how specifically CERCLA will be mentioned.

Thank you for the opportunity to make comment. We sincerely hope our comment is instructive and that the final PAG will be changed to reflect our comments.

Respectfully,

Mary Lampert
Pilgrim Watch, director
148 Washington Street
Duxbury, MA 02332
Tel 781.934.0389
Email: mary.lampert@comcast.net

Peter Crane / 6545 27th Ave. NW / Seattle WA 98117 / kinderhook46@yahoo.com */ 206-819-2661 (cell)*

July 4, 2013

Air and Radiation Docket and Information Center
Environmental Protection Agency
Mail Code: 6102T
1200 Pennsylvania Ave., NW
Washington, DC 20460

Attn: Docket ID No. EPA-HQ-OAR-2007-0268

To the Docket:

Introduction and Summary

I appreciate the opportunity to comment on EPA's draft PAG Manual, "Protective Action Guides And Planning Guidance For Radiological Incidents." I will limit myself to the portions of the document that relate to potassium iodide (KI).

The EPA draft has serious defects, both of omission and commission, that require correction. Regrettably, it conforms to a pattern all too familiar to those who have followed the KI issue over the past 30 years, when agencies with no special expertise in drug safety venture into this area.

On the subject of KI, EPA should simply have deferred to the Food and Drug Administration. It has expert knowledge both about drugs in general and KI in particular, having declared it "safe and effective" for use in radiological emergencies as long ago as 1978. Instead, EPA 's draft includes warnings about contraindications for using KI that conflict significantly with FDA's.

Moreover, the EPA PAGs fail to mention two of the most significant studies of the safety and effectiveness of KI: the National Academies of Science report, commissioned by Act of Congress and published in 2004, and the paper, co-authored by Drs. Janusz Nauman and Jan Wolff, that described the Polish experience in administering KI after Chernobyl. These striking omissions demand correction.

Discussion

Potassium iodide is to my knowledge the sole aspect of American life in recent years in which the Government has made a conscious decision to weaken rather than strengthen public protection against terrorism. As the *Washington Post* reported on April 7, 2011:

> The U.S. Strategic National Stockpile stopped purchasing the best-known agent to counter radioactive iodine-induced thyroid cancer in young people, potassium iodide, about two years ago and designated the limited remaining quantities "excess," according to information provided by the U.S. Centers for Disease Control and Prevention to ProPublica. Despite this, the CDC Web site still lists potassium iodide as one of only four drugs in the stockpile specifically for use in radiation emergencies.

Why was KI removed from the Strategic National Stockpile? Apparently, the committee that maintains the stockpile felt that it had no choice, in view of the 2008 decision of the late John Marburger III, Science Advisor to President Bush, refusing to implement the 2002 law that provided for distribution of KI beyond the 10-mile radius around nuclear plants in which the Nuclear Regulatory Commission (NRC) was offering it to states.[1]

Marburger's decision, which relied on technical support from the NRC staff, failed to heed the advice of a definitive National Academies of Sciences study, commissioned by Congress and published in 2004, which had concluded that in an accident, KI might in some cases be needed beyond the 10-mile radius. Produced by a committee consisting of 13 distinguished experts from the United States and abroad, and published in book form in 2004 as *Distribution and Administration of Potassium Iodide in the Event of a Nuclear Incident*, its 248 pages constitute the definitive Government-sponsored study of the drug. (President Obama's Science Advisor, John Holdren, has so far refused to disturb his predecessor's ill-advised decision, despite pleas for reconsideration from the

[1] In the interest of full disclosure, I should mention that the rule change under which NRC agreed in 2001 to provide KI to states for populations within the 10-mile radius was in response to a petition for rulemaking filed by me in 1995. The grant of that petition was a decision of the NRC Commissioners, made over the bitter opposition of the NRC technical staff.

American Thyroid Association, Congressman Ed Markey, and others.)[2]

The question that readers new to this subject may be asking is this: what is the basis for the opposition to KI? What is so wrong with having it available in emergencies?

Perhaps the clearest and most forthright answer came from the NRC's senior adviser for preparedness, quoted in an October 22, 2007 article in USA Today ("White House may stop plan for anti-radiation pills") as saying that the NRC "opposes broad distribution of the pills because the best way to eliminate risk is to make sure people don't eat contaminated food." The article continued:

> She also says the NRC is concerned about undermining the reputation of the nuclear industry. "It's always a concern that if you expand the distribution (of the pills), you don't have confidence in the plants," she says. "We have studies that show the safety of our plants."

Thus the need to send a message of confidence in the safety of nuclear power plants trumps preparedness for possible acts of radiological terrorism.[3] We just have to hope

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[2] If readers consulted the NAS report, they would recognize the factual problem with one statement on page 22 of the EPA document: "**Although the size of the EPZ is based on the maximum distance at which a PAG might be exceeded**, the actual boundary of an EPZ should be demarcated by features readily identifiable by people within that area." [Emphasis added.] This strongly implies that the 10-mile EPZ provided by NRC regulations is adequate to ensure that PAGs will not be exceeded. However, the NAS report was clear in saying that under some accident conditions, KI would be needed beyond the boundaries of the EPZ – a finding that the NRC staff refused to acknowledge. See the March 27, 2006, letter to NRC from HHS Secretary Michael Leavitt, sharply criticizing the NRC for mischaracterizing the findings of the NAS report in a letter to HHS, in which it had used selective quotation to create the inaccurate impression that the NAS saw no need for KI beyond the 10-mile EPZ. (See joint letter of September 26, 2007, from Professor Frank von Hippel and Peter Crane to Senator Joseph Lieberman, accessible here: http://pbadupws.nrc.gov/docs/ML0728/ML072831363.pdf) For his earnest desire to ensure better radiation protection for American children, his major concern, Secretary Leavitt was stripped of authority over KI in July 2007. That authority was transferred to the President 's Science Advisor and NRC, with the entirely foreseeable result that the statute was effectively nullified a few months later.

[3] There are easy answers to these arguments. First, KI is a supplement to other measures, not a substitute for them. We are better off having more arrows in our q uiver in an emergency than fewer. As to the notion that having KI would suggest that nuclear plants are unsafe, the same rationale would support removing life jackets and lifeboats from ferry boats, lest the public see them as implying that the boats are unsafe. The NRC position, incidentally, corresponds exactly to that expressed by NUMARC, a nuclear trade association (forerunner of today's Nuclear Energy Institute), which declared in a 1993 White Paper

that the day never comes that KI is needed, and the nation learns that the drugs that once were in the Strategic National Stockpile were disposed of as "excess."

In an op-ed published in the *New York Times* on March 23, 2011, as the Fukushima accident was unfolding, Professor Frank von Hippel of Princeton University commented that the Nuclear Regulatory Commission had "fought relentlessly" against the stockpiling of KI. This was by no means an exaggeration. As though to prove his point, an NRC staffer was quoted in an Associated Press article of March 31, 2011, as saying that the agency was "absolutely confident" that a 10-mile radius for KI distribution was sufficient. Whether right or wrong, it was plainly premature, with the accident still in progress, for NRC to reach any such conclusion.

All too often, the NRC has used interagency consultative processes to press its deeply held policy views on other agencies, sometimes to their later regret.[4] I wish to stress in the strongest terms, however, that I have no knowledge that this occurred here.

Invariably, in the various defective Government issuances on KI, we see a suppression of pertinent and valuable information on the one hand, coupled with the introduction of erroneous and misleading information on the other. This EPA document is no exception. The most egregious omission is the absence of any discussion or citation of the National Academies of Science report on KI referred to earlier. This is as incomprehensible as if a Government agency published a document on the causes and effects of nuclear accidents without mentioning the Kemeny Commission report on Three Mile Island, or on the risks of space flight without mentioning the Rogers Commission report on the Challenger disaster.

To take another example, the best empirical data on the safety of KI when used on a

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that if KI were stockpiled, "public confidence in the technology could be affected."

[4] For example, in 2004, HHS issued draft KI guidelines, pursuant to the 2002 statute. It discovered only afterwards that what it had published was a recycled version of an NRC staff paper from 1997, SECY-97-124, which the NRC Commissioners had rejected at that time, for good reason. In the HHS notice, as in the NRC staff paper, there was no mention of Chernobyl or of the FDA "safe and effective" finding, and the reader had to get many pages into the notice to find out that the purpose of KI was to prevent cancer. A rueful HHS withdrew the guidelines and started again from scratch.

mass scale is the Chernobyl accident, in which Polish authorities, under the direction of Dr. Janusz Nauman, gave out 18 million doses of the drug, 10 million of them to children, within a short time. The total number of persons with adverse reactions requiring hospitalization, and that only briefly, was two. Both were adult males who took the drug despite knowing that they were allergic to iodine.[5]

Dr. Nauman co-authored a paper on the Polish KI experience with Dr. Jan Wolff, an American scientist at the National Institutes of Health: Nauman J, Wolff J. "Iodide Prophylaxis in Poland After the Chernobyl Reactor Accident: Benefits and Risks." *Am J Med* 1993; 94: 524-532. It is a seminal, basic work in the field, and is cited in the FDA guidance on KI and innumerable other studies in this area. I cannot think of a single journal article or government study on KI in nuclear emergencies that does not refer to it – with the sole exception of these draft PAGs, which neither mention nor cite it.

Why the omission? Surely it is important for readers of the PAGs to know that the risks of KI administration on a mass scale, while not negligible, are extremely small.[6] As I was preparing these comments, I telephoned the EPA contact on the PAGs paper to

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[5] Dr. Nauman once told me, "We asked them why they had taken it, after they had been warned not to, and they said, 'We thought it was a matter of life and death.'"

[6] It is worth noting that in the 1990's, the NRC technical staff was deeply displeased by the Nauman-Wolff paper, since it undercut the staff's argument that the risks of KI administration were unacceptably high for the drug to be stockpiled. In a 1998 technical assessment of KI (Draft NUREG -1633, "Assessment of the Use of Potassium iodide (KI) As a Public Protective Action During Severe Reactor Accidents), the NRC staff even made a disparaging reference to the Nauman-Wolff article, saying of it, "to the extent we believe the report...." I drew attention to this slur in a paper I gave at Cambridge University in the summer of 1998, "Potassium Iodide Prophylaxis and the United States Government: A Case Study,"which can be found in book form in *Radiation and Thyroid Cancer*, published in 1999 by the European Commission, DOE, the National Cancer Institute, and Cambridge University. Criticizing this "aspersion upon two internationally renowned medical experts," I urged the Commissioners to withdraw the document and issue a "deep and contrite apology" to Drs. Nauman and Wolff. The NRC Commissioners did in fact order the report withdrawn from circulation (63 FR 55653, Oct. 16, 1998), and in an implicit apology, Dr. Nauman was invited to NRC headquarters to address the relevant staff. Twice in the next several years, the NRC staff sent revised drafts of NUREG-1633 to the Commission for approval. Both were rejected. At last the Commissioners los t patience, and by a 4-1 vote, ordered work on the project to cease. Officially, therefore, the document does not exist, except as an attachment to a rejected staff proposal. But rather than being consigned to the dumpster, as the Commissioners seem to have intended, it was given new life when it was cited with evident approval in the Marburger decision referred to earlier.

ask the reason for the omission of the NAS study, and was informed that the authors of the draft felt that the FDA guidance from 2001 was so useful that it should be emphasized.

Leaving aside for the moment that a citation to the NAS report would hardly have detracted from whatever emphasis was given to the FDA guidance, the difficulty with this argument is that the PAGs actually **conflict** with the FDA guidance. They offer warnings about the risks of KI that are quite at odds with what the FDA said in 2001.

If we carefully compare the two, on the critical question of medical contraindications for KI use, we see subtle but extremely significant differences. First, here is the 2001 FDA guidance, at page 5:

> Short-term administration of KI at thyroid blocking doses is safe and, in general, more so in children than adults. The risks of stable iodine administration include sialadenitis (an inflammation of the salivary gland, of which no cases were reported in Poland among users after the Chernobyl accident), gastrointestinal disturbances, allergic reactions and minor rashes. In addition, persons with known iodine sensitivity should avoid KI, as should individuals with dermatitis herpetiformis and hypocomplementemic vasculitis, extremely rare conditions associated with an increased risk of iodine hypersensitivity.
>
> Thyroidal side effects of stable iodine include iodine-induced thyrotoxicosis, which is more common in older people and in iodine deficient areas but usually requires repeated doses of stable iodine. In addition, iodide goiter and hypothyroidism are potential side effects more common in iodine sufficient areas, but they require chronic high doses of stable iodine (Rubery 1990). In light of the preceding, individuals with **multinodular goiter**, Graves' disease, and autoimmune thyroiditis **should be treated with caution, especially if dosing extends beyond a few days**. The vast majority of such individuals will be adults. [Emphasis added.][7]

[7] I am grateful to Professor von Hippel for pointing out to me that the guidance on KI currently posted on the FDA website includes a line not found in the 2001 guidance: "People with nodular thyroid with heart disease should not take KI." See

Now let us look at EPA's draft PAGs, at p. 20:

> **Some people should not take KI**. As a rule, individuals with known allergy to iodine or with pre-existing thyroid disease (e.g., Graves' disease, **thyroid nodules**, Hashimoto's thyroiditis) that might predispose them to adverse reactions should avoid KI. [Emphasis added.]

Thus there are at least two noteworthy differences. First, "multinodular goiter," in the FDA document, has been changed to "thyroid nodules." Second, instead of saying that these patients should be "treated with caution," as FDA does, EPA tells us they should "not take" and should "avoid" KI.

To fully appreciate the pernicious impact of these changes, one must know the prevalence of thyroid nodules among the American population. Here is the first paragraph of "Nonpalpable Thyroid Nodules—Managing an Epidemic," an article by Dr. Douglas S. Ross of Massachusetts General Hospital and Harvard Medical School, published in the Journal of Clinical Endocrinology & Metabolism on May 1, 2002 (vol. 87 no. 5 1938-1940):

> **Thyroid nodules are extraordinarily common**. The prevalence of palpable thyroid nodules in two non-biased population-based studies—Framingham, Massachusetts, and Whickham, England—was 4.2 and 3.2%, respectively (1, 2). In the Framingham study, the prevalence was 6.4% in women and 1.5% in men (1). The true prevalence of thyroid nodules, however, requires autopsy data. A 1955 study at the Mayo Clinic found thyroid nodules in 50.5% of 821 consecutive autopsies of patients with clinically normal thyroid glands (3). Because 7.4% of autopsies were excluded from analysis because of premortem thyroid disease, **the true prevalence is slightly higher than half the population**. Even in an unlikely group of patients to have thyroid nodules, men in the military aged 18–39 yr, the prevalence of thyroid nodules at autopsy was 13% (4). [Emphasis

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http://www.fda.gov/Drugs/EmergencyPreparedness/BioterrorismandDrugPreparedness/ucm072265.htm. However, in the population sought to be reached by a KI program – those below the age of 40, and above all children – there will presumably be very few individuals with both thyroid nodules **and** heart disease.

added.]

Whether or not by design, the effect of these selective omissions and insertions is thus to create a document that would serve as a perfect tool for persuading state, local, and federal authorities that to stockpile and administer KI is unwise, because so large a fraction of the population would be placed at risk. And as noted earlier, there will be no references to the NAS report, or to the Polish experience with KI, that might lead anyone to realize that there may be a good case for stockpiling the drug after all.

Conclusion

During the Fukushima accident, when some on the West Coast were opportunistically peddling KI to frightened citizens at high prices, I went on television in Seattle to condemn their "irresponsible scaremongering." I thought it reprehensible of these entrepreneurs to exaggerate the benefits of KI in a situation where there was no need for anyone in the United States to be taking it. But it is every bit as reprehensible, in my view, for opponents of KI to exaggerate the risks of using the drug in potential future situations where the need for it actually **does** exist or **may** exist. One form of alarmism and disinformation is no better than the other.

Rather than drafting its own list of cautions for those taking KI, EPA should simply incorporate the FDA guidance verbatim. With respect to the omission from the draft of any mention of the NAS report and the Nauman/Wolff journal article, EPA should in its revision of the draft draw attention to these documents and discuss their findings, given their central importance to a proper understanding of the KI issue.

Fortunately, no radiological event requiring KI administration has ever occurred in this country, and we hope one never does. But we know that it **could**. That makes it incumbent on government agencies and on all of us to address these issues on the basis of sound, honest, complete information: the truth, the whole truth, and nothing but the truth. Regrettably, these guidelines in their present form do not meet that test.

Nearly 20 years ago, Senators Joseph Lieberman and Alan Simpson, a Democrat and a

Republican, wrote to the NRC in an effort, futile at the time, to persuade that agency to support stockpiling of potassium iodide. (Letter of April 20, 1994.) In it, they pointedly reminded the NRC Commissioners of their "moral responsibility to provide the public with complete and accurate information" on the KI issue. Today, that moral responsibility rests with EPA, and I trust the agency will rise to it.

Finally, I recommend that EPA extend the comment period by an additional 60 days, to enable commenters to give the draft PAGs the careful scrutiny they plainly require.

Ms. Mary Lampert of Pilgrim Watch has advised me that she agrees with these comments and wishes to be associated with them.

Sincerely,

/s/

Peter Crane
NRC Counsel for Special Projects (retired)

Interjurisdictional Planning Committee

County of Orange•County of San Diego•City of San Clemente•City of San Juan Capistrano
City of Dana Point•California State Parks•U. S. Marine Corps•Southern California Edison

July 3, 2013

Radiation Protection Division
Center for Radiological Emergency Management
EPA - Mail Code 6608J
U. S.
1200 Pennsylvania Avenue NW
Washington DC, 20460

On behalf of the San Onofre Nuclear Generating Station Interjurisdictional Planning Committee (IPC), I respectfully submit comments for the draft EPA PAG Manual. The comments were drafted by the Orange County Health Care Agency Radiological Protection Officer and reviewed by the IPC.

The IPC appreciates the opportunity to offer comments and recommendations. Thank you for your consideration.

Sincerely,

Sara Kaminske

Sara Kaminske
Chair, Interjurisdictional Planning Committee
Assistant Emergency Manager
Orange County Sheriff's Department
Emergency Management Division

SONGS Interjurisdictional Planning Committee

Comments for the 2013 Draft PAG Manual

1. DRL Tables: The new PAG manual no longer includes DRL tables, but references them and directs users to the 2010 FRMAC Assessment Manual. However, review of this manual failed to locate DRL tables similar to the Tables 5.1, 5.2, 5.3 5.4, 5.5, and 7.1 from the 1992 PAG manual, only the algorithms to work them out. This makes the PAG manual much less useful as a one-stop document, and will be very difficult to use in an emergency. This will cause significant delay in calculations and thereby create an undue risk to the health and safety of the public.

   Recommendation: Replace in the new PAG manual DRL Tables similar to the Tables 5.1, 5.2, 5.3 5.4, 5.5, and 7.1 from the 1992 PAG manual.

2. DCF Tables: If during an emergency computers fail, OROs will have to perform dose projections by SOP and calculator. DCF tables similar to Tables 5.1, 5.2, 5.3 5.4, 5.5, and 7.1 will be required to do this. Attempting to calculate these values during an emergency based on the algorithms in the FRMAC manual will cause undue delay and could create a hazard to the safety of the public.

   Recommendations: Replace in the new PAG manual DCF tables similar to Tables 5.1, 5.2, 5.3 5.4, 5.5, and 7.1 from the 1992 PAG manual.

3. 50 Year PAG: The 50 year PAG was removed from the new PAG manual. No explanation was provided for the removal of this PAG. This was a useful value which provided an extra level of protection to the public. Unless there is a justifiable reason for the removal of this PAG, it should be left alone. Additionally, the 50 year PAG is still found in referenced FDA guidance, making that guidance conflict with the new PAG manual.

   Recommendation: Replace the 50 year PAG.

4. Water PAG: A subject of great anticipation with the new PAG manual was the inclusion of a water PAG. This is a PAG that is desperately needed by local authorities so that they have a solid value that they can use to help ensure the protection of the public, and a water PAG should be included in the manual. The new PAG manual references the NPDWR limit of 4 mR/year for Gamma, however there is no "official" PAG in the new manual.

   Recommendation: Use the NPDWR 4 mR/yr value as the water PAG in the new PAG manual.

5. Pg 24, 2.4.3.- FRMAC Guidance: This section is one of several references to the FRMAC manual to get DRLs and DCF's however these tables are not in the FRMAC guidance. Additionally this section references and recommends the use of "Turbo FRMAC", however Turbo FRMAC is not available for use from any source. Is it reasonable, desirable, or even legal for FRMAC to force all REP states to adopt FRMAC dose assessment methodologies?

   Recommendation: Restore to the new PAG manual Tables similar to the Tables 5.1, 5.2, 5.3 5.4, 5.5, and 7.1 from the 1992 PAG manual.

6. Chapter 4: This section includes guidance in the disposal of radiological contaminated waste, and indicates that federal disposal facilities could not accommodate contaminated wastes from a large radiological incident. Review of this section indicates a much greater role for local disposal of such waste than may be currently anticipated, and may require greater coordination at the local level. However, while state and local authorities have the primary role of managing and removing this waste as part of the emergency response and recovery, no authority exists below the federal level to establish a permanent radiological waste facility. Further, the radiological material associated with the contamination will still be the property of the DOE, who through that ownership, along with the NRC will be ultimately responsible for the proper disposal (Nuclear Waste Policy Act, 1992).

   Recommendation: Clarify in the document that the responsibility for the radiological waste and its disposal will ultimately belong to the Federal government.

4.1.3

2013

PAG Manual

Protective Action Guides
And Planning Guidance
For Radiological Incidents

U.S. Environmental Protection Agency
Draft for Interim Use and Public Comment
March 2013

In the early phase, there may be little or no data on actual releases to the environment and responders may have to rely on crude estimates of airborne releases. Decision time frames are short and preparation is critical to make prudent decisions when data are lacking or insufficient.

The principal protective actions for the early phase are evacuation and sheltering-in-place. These protective actions would be taken if whole body doses are projected to exceed 1 to 5 rem (10 to 50 mSv) over four days. The decision to evacuate must weigh the anticipated radiation dose to individuals in the affected population against the feasibility of evacuating within a determined time frame and the risks associated with the evacuation itself. For example, evacuating a population of 50,000 carries with it a statistical risk of injury or death from transportation hazards or increased exposure. Evacuation also takes time. In the case of an accident at an NPP, there may be sufficient time for an orderly and relatively safe evacuation. In the case of a fire or explosion of an RDD in an urban area, evacuating a large group of people could leave them exposed to the plume and actually increase radiation dose. Sheltering-in-place may be warranted in situations where evacuation poses a greater risk of exposure or physical harm.

In addition, there are actions that are advisable, but not associated with a numerical PAG. For example, individuals should be instructed to cover airways (nose and mouth) with available filtering material when airborne radionuclides may be present. Decontamination is another protective action that may be utilized in the early phase and may include washing of contaminated individuals, removing contaminated clothing and decontaminating surfaces of critical areas and objects. Further, in areas where airborne radioactivity is present but PAGs are not exceeded, officials can consider asking people to stay indoors to the extent practicable. In such cases, individuals are not prevented from carrying out necessary tasks (e.g., seeking medical care, purchasing food). Similar to actions used in major cities on high pollution days, these measures can be effective to reduce radiation doses when prolonged releases occur, as was the case for the Fukushima accident in Japan.

In cases where significant quantities of radioiodine may have been released, administration of the radioprotectant KI should be considered as a supplementary protective action if the projected child thyroid dose exceeds 5 rem (50 mSv). This PAG is lower than the 1992 guidance. The lower dose, which FDA adopted in 2001, is for protection of children based on early studies of Chernobyl exposure data.

The choice of protective action will be based on the status of the incident site and the prognosis for worsening conditions. In the early phase, precautionary actions based on worst-case scenarios may be used before implementation of protective actions based on PAGs. For example, in the case of RDD detonation, governments may instruct affected populations to shelter in place as a precautionary action while radiation levels are being measured to determine appropriate PAG-based protective actions. Officials should plan for rapid broadcast and dissemination of protective action orders to the public.

When available, predictions of radiological conditions in the environment based on an estimate of the source or actual environmental measurements may be used. Nuclear facilities, for example, have continuous, real-time radioactive effluent monitoring capabilities to monitor radioactive material released to the environment and may have a network of off-site measurement stations.

1.4.3. Intermediate Phase Protective Action Guides and Protective Actions

Intermediate phase activities are intended to reduce or avoid dose to the public, to control worker exposures, to control the spread of radioactive contamination and to prepare for late phase cleanup operations.

However, FDA understands that a KI administration program that sets different projected thyroid radioactive exposure thresholds for treatment of different population groups may be logistically impractical to implement during a radiological emergency. In such cases, FDA recommends that KI be administered to both children and adults at the lowest intervention threshold (i.e., >5 rem (50 mSv) projected internal thyroid exposure in children) (FDA 2002).

Note that KI is effective only against uptake of radioiodine, and is best taken prior to or just after exposure. The protective effect of a single dose of KI lasts approximately 24 hours. It should be administered daily until the risk of significant exposure to radioiodine (either by inhalation or ingestion) no longer exists.

It should be noted that adults over 40 need to take KI only in the case of a projected large internal radiation dose to the thyroid (>500 rem (5 Sv)) to prevent hypothyroidism which could lead to lifelong dependence on thyroid hormone replacement therapy. Thyroid irradiation in adults over 40 years of age is associated with an extremely low incidence of cancer (FDA 2001).

Some people should not take KI. As a rule, individuals with known allergy to iodine or with pre-existing thyroid disease (e.g., Graves' disease, thyroid nodules, Hashimoto's thyroiditis) that might predispose them to adverse reactions should avoid KI.

Pregnant women should be given KI for their own protection and for that of the fetus, as iodine (whether stable or radioactive) readily crosses the placenta. However, because of the risk of blocking fetal thyroid function with excess stable iodine, repeat dosing with KI of pregnant women should be avoided. Lactating females should be administered KI for their own protection, as for other young adults, and potentially to reduce the radioiodine content of the breast milk, but not as a means to deliver KI to infants, who should get their KI directly. As for direct administration of KI, stable iodine as a component of breast milk may also pose a risk of hypothyroidism in nursing neonates. Therefore, repeat dosing with KI should be avoided in the lactating mother, except during continuing severe contamination. If repeat dosing of the mother is necessary, the nursing neonate should be monitored.

Once the plume has passed, protective actions such as evacuation and/or sheltering-in-place and food control measures to limit exposure to radioiodine should be implemented and the administration of KI should be suspended. Food control measures include providing the public with non-contaminated food supplies while awaiting the eventual radioactive decay of contaminated food. Consumption of contaminated food may be permitted on a case-by-case basis after surveying the foodstuffs and determining the level of contamination consistent with FDA food and animal feeds guidance. As a result of radioactive decay, grain products and canned milk and vegetables from sources affected by radioactive fallout will not present a risk from radioiodine if they have been stored for weeks to months after production.

An RDD is not likely to contain radioiodine, so administration of KI would not be necessary in such incidents. The administration of other prophylactic drugs should be evaluated on a case-by-case basis depending on the nature of the event and the radioisotopes involved. For more information on radiological prophylactics and treatments, see: http://www.fda.gov/Drugs/EmergencyPreparedness/BioterrorismandDrugPreparedness.

2.3.5. PAGs and Nuclear Facilities Emergency Planning Zones (EPZ)

Under NRC regulations, before a nuclear power reactor may be issued a license, the NRC must find that licensee, state and local emergency plans are adequate and that they can be implemented. For nuclear power reactors, there is a plume exposure EPZ within a 10 mile (16.1 km) radius of the plant and for a site officials.[13] Once the initial protective actions have been implemented, accident assessment should continue. Although initial assessments may be uncertain, the subsequent assessments will be less uncertain as additional information on facility condition and prognosis, effluent radiation monitor data and environmental data become available. The results of these continuing radiological assessments, including dose projections, should be used as the basis for refining the initial protective actions. In the case of transportation accidents, an RDD or IND, or other incidents that are not related to a facility, it may not be practicable to establish EALs.

Doses that may be incurred from ingestion of food and water, long-term radiation exposure (i.e., longer than four days), radiation exposure to deposited radioactive materials, or long-term inhalation of resuspended materials are chronic exposures for which neither emergency evacuation nor sheltering-in-place are appropriate protective actions. PAGs for the intermediate phase cover these exposure pathways (see Chapter 3).

2.4.2. Duration of Exposure

The projected dose for comparison to the early phase PAGs is calculated for exposure during the first four days following the anticipated (or actual) start of a release. The objective is to encompass the entire period of exposure to the plume and deposited material prior to implementation of any further, longer-term protective action such as relocation. For planning purposes, the four-day period is chosen as the duration of exposure during the early phase because it is a reasonable estimate of the time necessary to make measurements, reach decisions and prepare to implement further protective actions (such as relocation) if necessary. However, officials at the site at the time of the emergency may decide that a different time frame is more appropriate.

For example, doses incurred through ingestion pathways or long-term exposure to deposited radioactive materials take place over a longer time period. Protective actions for such exposures should be based on guidance addressed in Chapter 3.

The projected dose from each radionuclide in a plume is proportional to the time-integrated concentration of the radionuclide in the plume at each location. This concentration will depend on the rate and the duration of the release and meteorological conditions. Release rates will vary with time and this time-dependence cannot usually be predicted accurately. In the absence of more specific information, the release rate may be assumed to be constant.

Another factor affecting the estimation of projected dose is the duration of the plume at a particular location. For purposes of calculating projected dose from most pathways, exposure will start at a particular location when the plume arrives and will end when the plume is no longer present. Exposure from deposited materials will continue for an extended period as long as people are present. Other factors such as the aerodynamic diameter and solubility of particles, shape of the plume and terrain may also affect estimated dose and may be considered on a site- or source- specific basis.

Prediction of time frames for releases is difficult because of the wide range associated with the spectrum of potential incidents. Therefore, planners should consider the possible time periods between an initiating event and arrival of a plume and the duration of releases in relation to the time needed to implement competing protective actions (i.e., evacuation and sheltering-in-place). Analyses of commercial nuclear power reactors (NRC 1975) have shown that some incidents may take several days to develop to the point of a release while others may begin as early as a half hour after an initiating event. Furthermore, the

[13] Immediate protective actions based on in-plant conditions are not applicable to naval nuclear propulsion plants. See Footnote 7 for additional information. In addition, because of differences in design and operation, EALs based on in-plant conditions are not applicable to naval nuclear propulsion plants.

		measure dose.
25 rem (250 mSv)[b]	Lifesaving or protection of large populations	Exceeding 5 rem (50 mSv) unavoidable and all appropriate actions taken to reduce dose. Monitoring available to project or measure dose.

[a] For potential doses >5 rem (50 mSv), medical monitoring programs should be considered.
[b] In the case of a very large incident, such as an IND, incident commanders may need to consider raising the property and lifesaving response worker guidelines to prevent further loss of life and massive spread of destruction.

The 25 rem (250 mSv) lifesaving response worker guidelines provide assurance that exposures will not result in detrimental deterministic health effects (i.e., prompt or acute effects). However, it could increase the risk of stochastic (chronic) effects, such as the risk of cancer. Response actions that could cause exposures in excess of the 25 rem (250 mSv) Response Worker Guideline should only be undertaken with an understanding of the potential acute effects of radiation to the exposed responder (see Table 2-3) and only when the benefits of the action clearly exceed the associated risks.

The estimated risk of fatal cancer[17] for workers exposed to 10 rem (100 mSv) is slightly less than the corresponding general population risk of 0.6 percent (6 cases per thousand exposed). Workers exposed to 25 rem (250 mSv) have an estimated risk of fatal cancer of 1.5 percent (15 cases perthousand exposed). Because of the latency period of cancer, younger workers face a larger risk of fatal cancer than older workers (for example, when exposed to 25 rem (250 mSv), 20 to 30-year-olds have a 9.1 per thousand risk of premature death, while 40 to 50-year-olds have a 5.3 per thousand risk of premature death).[18]

More specific risk determinations can be made when there is adequate information about the contaminants and the potential for human exposure. EPA's Federal Guidance Report #13 (EPA 1999) and Health Effects Assessment Summary Tables have risk factors for specific radionuclides.

Table 2-3. Acute Radiation Syndrome [a]

Feature or Illness	Effects of Whole Body Absorbed Dose from external radiation or internal absorption, by dose range in rad				
	0-100	100-200	200-600	600-800	>800
Nausea, Vomiting	None	5-50%	50-100%	75-100%	90-100%
Time of Onset		3-6 h	2-4 h	1-2 h	<1 h to minutes
Duration		<24 h	<24 h	<48 h	<48 h
Lymphocyte Count	Unaffected	Minimally Decreased	<1000 at 24 h	<500 at 24 h	Decreases within hours
Central Nervous	No	No Impairment	Cognitive	Cognitive	Rapid

[17] Risk per dose of a fatal cancer is assumed to be about $6x10^{-4}$ per rem ($6x10^{-5}$ per mSv). Cancer incidence is assumed to be about $8x10^{-4}$ per rem ($8x10^{-5}$ per mSv). (EPA 1999)
[18] The numerical estimate of cancer risk presented above (from Federal Guidance #13) was obtained by linear extrapolation using the nominal risk estimates based on data from human exposures at high doses and high dose rates. Other methods of extrapolation to the low-dose region could yield higher or lower numerical estimates of cancer deaths. Studies of human populations exposed at low doses are inadequate to demonstrate the actual magnitude of risk at low doses (about 0.1 Sv or 10 rem and below). There is scientific uncertainty about cancer risk in the low-dose region below the range of epidemiological observation and the possibility of no risk cannot be excluded. (EPA 1999)

events involving fixed nuclear facilities, some evacuation reception centers or shelters will have walk-through portal monitors.

2.8.1. Priorities for Control of Contaminated Areas

The following priorities are recommended—

1. Do not delay urgent medical care for decontamination efforts or for time-consuming protection of attendants, such as donning of additional anti-contamination clothing.
2. In early phase scenarios where it might not be practical or would interfere with other life-saving and public health protection priorities, do not waste effort trying to contain contaminated wash water and be sure to notify sewage treatment plants.
3. Do not allow monitoring and decontamination to delay an ordered evacuation.
4. *When early screening is needed after a major incident*— After plume passage, it may be necessary to establish emergency contamination monitoring stations in areas not qualifying as low background areas. Gamma exposure rates in such areas should be less than 5 millirem (50 µSv) per hour. These monitoring stations should be used only during the early phase after major atmospheric releases to monitor people emerging from possible high exposure areas. The stations should be set up to provide simple (rapid) decontamination if needed and to evaluate whether affected people should undergo more extensive decontamination or other special care. Table 2-5 provides guidance on surface contamination levels for use if such centers are needed.
5. Establish monitoring and personnel decontamination (e.g., bathing) facilities at evacuation centers or other locations in low background areas (less than 0.1 millirem (1 µSv) per hour). *Encourage self-decontamination:* Encourage evacuated people who were exposed in areas where release of particulate materials would have warranted evacuation to change and bag the clothes they were wearing and store them in an area away from people and pets until authorities provide further instructions on their disposition, to wash other exposed surfaces such as cars and trucks and their contents and then report to these centers for monitoring. For more specific considerations on control of contaminated areas refer to "Population Monitoring in Radiation Emergencies: A Guide for State and Local Public Health Planners" (CDC 2007).[20] Table 2-6 provides surface contamination guidance. These screening levels are examples derived primarily on the basis of easily measurable radiation levels using portable instruments.
6. After the relocation area has been established, consider the need to set up monitoring and decontamination stations at exits from the more highly contaminated parts of the area. Low levels of contamination may be undetectable because of high background radiation levels at these locations. Monitoring should be done at lowest practical background levels. Nevertheless, these individuals should be advised to bathe and change clothes at their first opportunity—no later than within the next 24 hours. If, after decontamination, people still exceed the limits for the station, they should be sent for further decontamination or for medical or other special attention.

[20] See: http://emergency.cdc.gov/radiation/pdf/population-monitoring-guide.pdf

Table 2-5. Recommended Surface Contamination Screening Levels for Emergency Screening of People and Objects at Monitoring Station in High Background Radiation Areas (0.1 mR/h to 1 mR/h Gamma Exposure Rate)[a]

Condition	Appropriate detection instrument reading	Recommended Action
Before Decontamination	<2x existing background	Unconditional release
	>2x existing background	Decontaminate. Equipment may be stored or disposed of as appropriate.
After Decontamination	<2x existing background	Unconditional release
	>2x existing background	Continue to decontaminate or refer to low background monitoring and decon station. Equipment may be stored for decay or disposed of as appropriate.

[b] Monitoring stations in such ~~high~~ exposure rate areas are for use only during the early phase of an incident involving major atmospheric releases ~~of particulates~~. Otherwise use Table 2-6.

Table 2-6. Recommended Surface Contamination Screening Levels for People[a] and Objects at Monitoring Stations in ~~Low~~ Background Radiation Areas (<0.1 mR/h Gamma Exposure Rate)[b]

Condition	Appropriate detection instrument reading	Recommended Action
Before decontamination	<2x existing background	Unconditional release
	>2x existing background	Decontaminate
After simple[c] decontamination effort	<2x existing background	Unconditional release
	>2x existing background	Full decontamination
After full[d] decontamination effort	<2x existing background	Unconditional release
	>2x existing background	Continue to decontaminate people Release animals and equipment
After additional full decontamination effort	<2x existing background	Unconditional full release
	>2x existing background	Send people for special evaluation Release animals and equipment

[a] People reporting to monitoring stations in low background radiation areas have been previously instructed to change and bag clothes, wash other exposed surfaces such as cars and their contents and then report to these centers for monitoring.
[b] Levels higher than 2x existing background (not to exceed the meter reading corresponding to 0.1 mR/h) may be used to speed the monitoring of evacuees in very low background areas.
[c] Flushing with water and wiping is an example of a simple decontamination effort.
[d] Washing or gentle scrubbing with soap or other mild detergent followed by flushing is an example of a full decontamination effort.

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In addition, measurements should be conducted to determine the dose reduction factors associated with simple, rapid, decontamination techniques so that these factors can be used in calculating dose to people who are not relocated. However, assumptions about these factors should not be included in calculating projected dose for decisions on relocation. Only dose reductions already accomplished can be considered.

3.4.4. Exposure Limits for People Reentering the Relocation Area

After the relocation area is established, people will need to reenter for a variety of reasons, including recovery activities, retrieval of property, security patrol, operation of vital services and, in some cases, care and feeding of farm and other animals. It may be possible to quickly decontaminate access ways to vital institutions and businesses in certain areas so that they can be occupied by adults either for living (i.e., institutions such as nursing homes and hospitals) or for employment. Clearance for occupancy of such areas will require dose reduction to meet exposure limits (EPA 1987). Dose projections should include both external exposure from deposited material and inhalation of resuspended deposited material for the duration of the planned exposure. People working in areas inside the emergency relocation area should operate under the controlled conditions established for occupational exposure (EPA 1987). The worker dose limitation does not need to include ongoing doses received from living in a contaminated area outside the relocation area. It is also not necessary to consider dose received previously from the plume or groundshine during the early phase of the radiological incident.

3.5. PROTECTIVE ACTION GU IDANCE FOR FOO D AND DRINKING WATER

Information on food and animal feeds protective action guidance is contained in FDA's "Accidental Radioactive Contamination of Human Food and Animal Feeds: Recommendations for State and Local Agencies" (FDA 1998).

EPA is not proposing a specific drinking water PAG at this time. EPA has established enforceable drinking water standards for radionuclides under the Safe Drinking Water Act (SDWA). EPA recommends that to the extent practicable, emergency measures for drinking water be based on the National Primary Drinking Water Regulations (NPDWR) for Radionuclides. The Radionuclides Rule provides states with flexibility when responding to radiological events. If a public water system exceeds the radionuclides standard it must work to get back into compliance as soon as feasible. States have the authority to determine if other corrective actions are needed (e.g. providing alternative water).

However, the Agency recognizes a short-term emergency drinking water guide may be useful for public health protection in light of the Fukushima nuclear power plant accident, which impacted some Japanese drinking water supplies. Input on the appropriateness of, and possible values for, an intermediate phase emergency drinking water PAG is being sought during the public review of this Manual.

While the NPDWR provide for a regulatory standard of 4 mrem/year (beta, photon emitters) based on life-time exposure, international organizations have developed technical approaches and methodologies that have produced a range of emergency guidelines related to drinking water (e.g., the World Health Organization[24], the International Atomic Energy Agency[25]) as have other federal agencies (e.g., the Department of Homeland Security[26], the Food and Drug Administration[27]) and non-federal organizations. EPA is seeking input on an approach and technical rationale for a drinking water PAG designed to help

[24] See: http://www.who.int/water_sanitation_health/dwq/gdwq3rev/en/ and http://www.who.int/hac/crises/jpn/faqs/en/index8.html.
[25] See: http://www-pub.iaea.org/MTCD/publications/PDF/Pub1467_web.pdf.
[26] See: http://ogcms.energy.gov/73fr45029.pdf
[27] See: http://www.fda.gov/downloads/MedicalDevices/.../UCM094513.pdf

THE ENDOCRINE SOCIETY

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July 15, 2013

Air and Radiation Docket and Information Center
Environmental Protection Agency
Mail Code: 6102T
1200 Pennsylvania Ave NW
Washington, DC 20460

Re: Docket ID No. EPA-HQ-OAR-2007-0268

To Whom It May Concern:

On behalf of The Endocrine Society, we appreciate the opportunity to provide comments to the Environmental Protection Agency (EPA) regarding the EPA's ***Protective Action Guides (PAG) Manual: Protective Action Guides and Planning Guidance for Radiological Incidents*** (Fed Reg 78 FR 22257, 04/15/2013). Founded in 1916, the Society represents more than 16,000 physicians and scientists engaged in the treatment and research of endocrine disorders such as osteoporosis, diabetes, hypertension, infertility, obesity, and thyroid disease. The Society looks forward to working closely with the EPA as it engages and assists public officials in planning for an emergency response to radiological incidents.

The Society has reviewed the latest draft of the Protective Action Guide and would like to thank the Agency for its efforts to comprehensively approach the response of public officials to either the deliberate or accidental release or potential release into the environment of radioactive materials sufficient to warrant consideration of protective actions. The Society appreciates the opportunity to provide feedback to the Agency on this important threat to public health.

The Society has concerns related to the PAG's recommendations for use of potassium iodide (KI) as a thyroid blocking agent during radiological emergencies. Section 1.1 currently lists administration of KI as a supplemental action. We feel this language suggests that KI administration is a secondary or optional action to take. We believe the Agency should clearly state that KI administration (to the appropriate groups of individuals with significant exposure as recommended by the Food and Drug Administration) is a mandatory and essential action to take in the event of a radiological incident. KI should be viewed as an essential component of the response to a radiological emergency along with evacuation, sheltering and avoiding contaminated food, milk and water.

We believe Section 2.3.4 should clearly emphasize that KI is a safe and effective protective measure against the harmful thyroidal effects of radioactive iodine release. The Society supports predistribution of KI so that it can be made available to the public in as short a time as possible in the event of a significant release of radiological materials into the environment. Since KI is best taken prior to or just after exposure, we suggest the Agency modify Sections 2.3.4 and 2.3.5 to encourage the predistribution of KI so that it can be delivered and administered as quickly as possible to maximize its chances of successfully blunting the risk of exposure to radioiodine in the event of an emergency.

Thank you for the opportunity to provide input to the Agency on the proposed Protective Action Guides and Planning Guidance for Radiological Incidents. The Endocrine Society appreciates the efforts of the Agency to engage medical specialties and solicit comments, and looks forward to working with the EPA as it further develops this guide. Should you have any questions, please do not hesitate to contact Stephanie Kutler, Director of Government Affairs, at skutler@endocrine.org or (301) 941-0254.

Sincerely,

TK Woodruff

Teresa K. Woodruff, Ph.D.
President, The Endocrine Society

July 15, 2013

Via Electronic Mail

U.S. Environmental Protection Agency
1200 Pennsylvania Ave NW
Washington, DC 20004

RE: Natural Resources Defense Council Comments on the EPA's DRAFT PAG Manual

Dear Sir/Madam:

The Natural Resources Defense Council (NRDC) offers the following comments regarding the Environmental Protection Agency's (EPA's) Draft "PAG Manual: Protection Action Guides and Planning Guidance for Radiological Releases," March 2013, Docket ID No. EPA-HQ-OAR-2007-0268. This manual is a proposed draft of an update of EPA's 1991 PAG Manual, 78 Fed. Reg. (15 April 2013) 22257-22260.

General Comments

The National Academies' BIER VII, Phase 2 Report gives "preferred estimates" of cancer risk per unit dose along with 95% subjective confidence intervals. The upper and lower bounds of these confidence intervals are typically a factor of two above and below the preferred estimates. In the event of a radiological accident, the bounds on the government's best estimates of effective doses to individuals—at 95% confidence—are likely to be significantly larger than a factor of two above and below the best estimates. Moreover, health risks can vary by as much as a factor of 20 depending upon the age and gender of the exposed individuals (and fetuses) and whether the government seeks to protect exposed individuals against the occurrence of cancer (morbidity) or only cancer fatality. Consequently, NRDC believes EPA can better serve the public by providing a more comprehensive discussion of risk, rather than focusing primarily on the specific dose ranges that should trigger protective actions. Further, where PAGs are offered EPA should establish separate PAGs for pregnant women, young children, average adults and senior citizens, or, in the alternative, set a single standard for all individuals at a level that protects the most vulnerable. In all cases the PAGs should be set on the basis of preventing cancer (cancer morbidity) and not just preventing fatalities.

NRDC endorses the analysis and recommendations of the group letter submitted by the Committee to Bridge the Gap, the Nuclear Information and Resource Service, NRDC and others, the conclusions of which are summarized here:

- Withdraw the 2013 EPA PAGs (Protective Action Guides)
- Do not weaken drinking water standards for radioactivity. Comply with existing Safe Drinking Water Act limits especially in the intermediate and late phases of disasters and cleanup. Provide real, concrete guidance to authorities on how to safeguard water supplies to protect the public to those levels or better.
- Eliminate any implication that EPA PAGs incorporate the worst provisions of Dept. of Homeland Security PAGS including "optimization" (a cost benefit analysis done by the polluter), use of "benchmarks" or ranges of radiation risk much higher than EPA historically allows.
- EPA should retain and strengthen, relocation PAGs for thyroid and skin doses and keep and strengthen (not weaken) the limit of 5 rem over 50 years.
- Replace the outdated FDA food contamination guidelines with markedly lower radioactivity in food.
- Do not permit nuclear waste to be disposed in regular garbage dumps, incinerators or hazardous waste sites, or sent to recyclers. Treat it like nuclear waste.
- Do not expand the PAGs, originally for big nuclear disasters, to apply to every radioactive release.
- We recommend that all parts of the PAGs that weaken or eliminate existing protections be abandoned, and all dose limits be tightened by at least the increased risk EPA now acknowledges for radiation.

Chapter 2, Early Phase Protection Action Guides.

EPA did not update its Early Phase Protection Action Guides for sheltering-in-place or evacuation [1 to 5 rem (10 mSv to 50mSv) over 4 days], from those in EPA's 1991 PAG Manual, and did not update the cost-benefit analysis which was the basis for the 1991 recommendations. NRDC believes these Early Phase PAGs are too low by roughly an order of magnitude—roughly a factor of 10. Our reasoning follows.

First, the 1991 PAG Manual, Appendix C assessment is based on an assumed risk of $3x10^{-4}$ cancer deaths per person-rem. Since 1991, the National Academies BEIR Committee has revised its risk estimates. The BEIR VII, Phase 2 Report (2006) best estimates is $5.7x10^{-4}$ cancer fatalities per person-rem for a mixed population of all ages and both genders. The government's price deflator index has increased by about 50 percent since 1991. Therefore, updating these two quantities alone suggest the Early Phase PAGs should be reduced by a factor of 2.5

from the 1991 recommendations.

Second, while the BEIR VII, Phase 2 Report (2006) preferred estimate is 5.7×10^{-4} cancer fatalities per person-rem for a mixed population of all ages and both genders, the preferred estimate for morbidity is 26.2×10^{-4} cancers per person-rem for a population of 10 year old girls. Thus, the morbidity risk for 10 year old girls is approximately 4.6 times greater than the fatality risk for a population of all ages and both sexes, and for young female babies or fetuses the risk is estimated to be more than twice as great as that for 10 year old girls.

As noted above, EPA's Early Phase Protection Action Guides for sheltering-in-place or evacuation are 1 to 5 rem (10 mSv to 50mSv) over 4 days. Based upon the preferred estimate from BEIR VII, a 10 year old girl exposed to 0.5 rem [5 mSv] would have a 0.13 percent chance of an excess cancer—one excess cancer in a population of 765 exposed girls. BEIR VII's 95 percent confidence limits approximate a factor of two higher and lower than its preferred estimate. Surely, in a community containing 765 young girls, one would seek to shelter or evacuate these girls to avoid the expected cancer(s) (uncertainty range 0.5 to 2 cancers).

In the introduction to Chapter 2, EPA properly notes, "In all cases. All practical and reasonable means should be used to reduce or eliminate exposure." Nevertheless, this cautionary note will be lost on a reader focusing on the numerical PAGs given in Table 2-1. Both in the introduction and the tables EPA should remind government officials and the public that a basic tenet of the health physics profession is that all radiation exposures are potentially harmful and therefore any radiation exposure should be kept as low as reasonably achievable. In this regard, unlike evacuation, there is minimal risk associated with sheltering-in-place. Thus, in the event of a significant radiation release or the potential for an imminent release, sheltering-in-place may be advisable even when the projected doses are less than the PAGs.

Protective Action Guidance for Drinking Water

EPA did not propose a specific drinking water PAG. Rather, the agency seeks input on an approach and technical rationale for a drinking water PAG. (PAG Manual, p. 42) Given that bottled water is widely available commercially throughout the country, NRDC sees no necessity in relaxing the established enforceable drinking water standards for radionuclides under the Safe Drinking Water Act (SDWA), limiting exposures from drinking water to 4 mrem per year.

Protective Action Guidance for Food

EPA endorses the PAGs contained in the FDA's "Accidental Radioactive Contamination of Human Foods and Animal Feeds: Recommendations for State and Local Agencies" (FDA 1998), PAG Manual, p. 42. As noted in the April 15, 2013, press release of the Committee to Bridge the Gap and the Nuclear Information and Resource Service (*see* Attachment A), "Extremely high food contamination levels would be allowed by the incorporation of Food and Drug Administration 1998 guidance. EPA officials had previously criticized those standards, saying that 1 in 50 people eating food at those levels would get cancer from their exposure, on top of our normal cancer risk." EPA apparently has forgotten that it is responsible for establishing Federal Guidance for radiation protection, and that it should not accede to the recommendations of other agencies that are contrary to the EPA's record on the matter.

Conclusion

For the above reasons NRDC believes EPA should withdraw the Draft 2013 EPA Protective Action Guides and start afresh, remembering that its responsibility is to protect the public.

Thank you for your consideration of these comments. Please do not hesitate to contact us at (202) 289-6868 if you have any questions.

Sincerely,

_________/s/__________
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Attachment A

EPA Dramatically Weakens Radiation Protection

For Immediate Release
Contacts: Dan Hirsch Committee to Bridge the Gap 831 336 8003
Diane D'Arrigo Nuclear Information and Resource Service 301 270 6477 x 15

April 15, 2013 The U.S. Environmental Protection Agency (EPA) is publishing in the Federal Register today controversial new Protective Action Guides (PAGs) for responding to radioactive releases. EPA says it solicits public comment but is nonetheless making the PAGs immediately effective.

The new PAGs eliminate requirements to evacuate people in the face of high projected thyroid, skin, or lifetime whole body doses; recommend dumping radioactive waste in municipal garbage dumps not designed for such waste; propose five options for drinking water, which would dramatically increase the permitted concentrations of radioactivity in drinking water, by as much as 27,000 times, compared to EPA's current Safe Drinking Water Act limits; and suggest markedly relaxing long-term cleanup standards.

"In essence the government is now saying nuclear power accidents could produce such widespread contamination and produce such high radiation levels that the government should abandon efforts to clean it up and instead force people to live with radiation-induced cancer risks orders of magnitude higher than ever considered acceptable," said Daniel Hirsch, president of Committee to Bridge the Gap.

The PAGs are intended to guide the response to nuclear power reactor accidents (like Fukushima in Japan, Chernobyl in Ukraine and Three Mile Island in the U.S.), "dirty bomb" explosions, radioactive releases from nuclear fuel and weapons facilities, and nuclear transportation accidents.

"EPA ignores the fact that women and kids are at even greater risk from radiation. The doses permitted by the 2013 EPA PAGs will allow indecent exposures to radiation," says Diane D'Arrigo of Nuclear Information and Resource Service. "Women are 50% more vulnerable than men and children are at even greater risk from radiation than adults, according to data from the National Academy of Sciences."

Extremely high food contamination levels would be allowed by the incorporation of Food and Drug Administration 1998 guidance. EPA officials had previously criticized those standards, saying that 1 in 50 people eating food at those levels would get cancer from their exposure, on top of our normal cancer risk.

The PAGs also incorporate and expand controversial Dept. of Homeland Security (DHS) PAGs adopted in 2008 which would allow long-term doses as high as thousands of millirems per year without cleanup being required. Associated guidance for carrying out the long-term cleanup, prepared for DHS and for which the comment period expires today, recommends abandoning EPA's long-held cleanup standards and instead allowing people to be exposed to doses as high as the equivalent of three chest X rays a day for one's entire life. Over 70 years, EPA estimates 1 in 6 people would get cancer from exposure that high, orders of magnitude higher risk than EPA has historically said is acceptable.

Attachment A

In addition, EPA admits that a nuclear power accident could far exceed the capacity of radioactive waste sites to manage waste generated from cleanups and therefore suggests allowing the waste to go to regular trash dumps, a fight the public has waged for decades in the US.

For more information: www.committeetobridgethegap.org and www.bit.ly/radstandards

15 July 2013

From: International Atomic Energy Agency - Incident and Emergency Centre

To: U.S. Environmental Protection Agency

SUBJECT: COMMENTS ON U.S. EPA PAG MANUAL

1. The International Atomic Energy Agency would like to submit the following comments on the recently published PAG Manual by the U.S. EPA. The specific changes are recommended in Annex A.
    a. In section 1.3.1 (Legal Basis) and 3.5 (Protective Actions Guidance for Food and Drinking Water), the EPA seeks input on an approach and technical rationale for a drinking water PAG. Detailed guidance on this is provided in IAEA General Safety Guide No. GSG-2, *Criteria for Use in Preparedness and Response for a Nuclear or Radiological Emergency*, particularly in Appendix II. It is recommended that the EPA take this international guidance into consideration in the elaboration of its approach on the subject.
    b. In section 1.3.2, (Technical Basis), the document quotes an old IAEA reference. The more correct reference would be Safety Standards Series No. GS-R-2 (IAEA 2002). The change should also be made in the reference section.
    c. In section 3.4.2, (Dose Projection), the document states "In addition, the FRPCC encourages the use of computational tools […] to implement PAGs." The IAEA recommends caution in the use of computer models during an emergency. A recently published IAEA guide, EPR-NPP Public Protective Actions 2013, *Actions to Protect the Public in an Emergency due to Severe Conditions at a Light Water Reactor*, states in section 2.3 (Tools to Support Protective Action Decision Making), "The control room operators cannot predict the timing, magnitude, composition, effective height and duration of most severe releases warranting urgent protective actions off the site. In addition, such a release could occur over several days resulting in very complex deposition patterns off-site. Consequently, dose projection models cannot be effectively used for making decisions concerning urgent protective actions that need to be taken before or shortly after the release in order to be most effective." The IAEA guidance recognizes that models may be useful, but later in the emergency: "After a release, wind directions and models may be useful in initially directing resources for off-site monitoring and sampling. [..]Dose projection models and other computer-based tools could also be used to assess environmental monitoring data in order to develop deposition and dose maps for decision-making."

Cal OES
GOVERNOR'S OFFICE
OF EMERGENCY SERVICES

To: U.S. Environmental Protection Agency
Center for Radiological Emergency Management

From: California Governor's Office of Emergency Services
Radiological Preparedness Unit

Subject: PAG Comments - Docket ID No. EPA-HQ-OAR-2007-0268

The California Governor's Office of Emergency Services would like to submit the following comments on the Draft PAG Manual.

1. *General Comment:* Removing the reference material and directing the reader to myriad additional references reduces the usefulness of this document. In addition, some of the referenced reports are copyrighted materials and require a fee to access. In an emergency the ability to obtain the many referenced documents may be severely limited, causing an undue risk to the public.

   R*ECOMMENDATION:* Incorporate the information applicable for the development of radiological response plans and protective action decision making.

2. *General Comment:* Portions of the document rely heavily on acronyms. Individuals that are not familiar with these acronyms will struggle with understanding the intended message. For example: See the first paragraph under Section 3.4.2, page 40.

   RECOMMENDATION: All acronyms should be reintroduced at the beginning of each section.

3. *General Comment:* The use of website links should be avoided unless the EPA intends to update this document frequently. These links change over time as do the originating documents – keep in mind that it has been 21 years since the last PAG revision.

   RECOMMENDATION: Remove the website links. State the controlling agency and reference document name.

4. *General Comment:* The EPA PAG document changes convert the existing PAG Manual into merely a list of other agencies PAGs. Exclusion of PAGs for drinking water, agriculture, Potassium Iodide administration, and other applicable standards creates the need for agencies to adopt multiple standards and refer to multiple documents for applicable guidance.

RECOMMENDATION: Include the applicable PAG's in the appropriate sections of the document.

5. Pages 9, 54, 69, 75, 76, and more. New terminology: Please examine your use of the terms "Reoccupancy" and "Return". The term "Return" has been used in the prior EPA PAG and in NPP emergency planning. Is there a need to differentiate between the two? Both are the return of populations to areas where the public has been ordered to leave (evacuation or relocation) and both allow for the public to return to areas with "acceptable" levels of contamination. It is reasonable to allow Return with restrictions.

   RECOMMENDATION: Pick one or provide a clear difference between them that does not confuse readers.

6. Page 15, Table 2-1, Footnote "a". The statement "Sheltering may begin at lower levels if advantageous" is unclear. Is the lower level between 1 and 5 rem? Or below 1 rem?

   RECOMMENDATION: Change the statement to say "Sheltering may begin at levels below 1 rem if advantageous".

7. Page 21, Footnote 10. The footnote expresses the opinion that since NNPP reactors are 1/5 the size of a commercial reactor and operated at only 1% power near port, then there is "no need for towns and cities to have special emergency response plans such as those required for cities near commercial NPPs"

   Commercial reactors are in the range of 1000Mw and 1/5 of that is 200Mw. NUREG 0654/FEMA REP 1 requires all commercial power plants over 50Mw to have extensive response plans and programs within the Emergency Planning Zones around the power plant, regardless of operating levels. This appears to contradict the statement that there is no need for special emergency response plans.

   RECOMMENDATION: Remove the last sentence of the footnote starting with "therefore there is no need…" Replace with "The Navy will work with affected jurisdictions to develop coordinated emergency plans for response to a Navy Nuclear Propulsion emergency."

8. Page 22, Section 2.4, Projected Dose. Referencing the FRMAC manuals for "detailed methods for estimating projected Dose…" indicates that the methods necessary to implement this document are located elsewhere. For the purposes of this draft, are we expected to review the FRMAC manual to ensure this section is correct?

   RECOMMENDATION: Include the methods for estimating projected dose in this manual.

9. Page 22, Section 2.4, Projected Dose. The last sentence in this section states "EROs are encouraged to use the most current, applicable tools and methods for implementing PAGs." Unfortunately the tools are not listed nor is there a list of the most accurate, and there is also no mention as to which is most appropriate.

RECOMMENDATION: Remove this sentence.

10. Page 13, Section 2.1 and Page 24, Section 2.4.3. The exclusion of Dose Conversion Factors (DCF), Derived Response Levels (DRL) and calculation methodologies makes this document more of a discussion of good ideas rather that a technical standard and reference document.

    RECOMMENDATION: Include DCFs, DRL, and calculation methodologies. Update the EPA PAGs as appropriate to maintain consistency.

11. Page 25, Section 2.6. NCRP documents are listed. These documents are not freely available and may not be available in an emergency.

    RECOMMENDATION: Add applicable information from the cited NCRP documents into the PAG.

12. Pages 26 and 27, Table 2.2, Response Worker Guidelines

    RECOMMENDATION: In the final publication, do not split tables.

13. Page 30 and 32, Section 2.7 last paragraph and tables 2-5, 2-6. The term two times the existing background is used. Does this mean twice the background above background or once above background: If background is 18 cpm, then is 2x background – 18+18 =36cpm or is it 36cpm above background, which is 18 cpm, so a meter reading of 54cpm?

    Conditions in our region have backgrounds from very low to relatively high levels. At the low end, simple dirt can double the background, but 2x the background above the background would indicate a real source of radiation.

    RECOMMENDATION: Either place a numerical limit such as “100 cpm” or explain 2 x background.

14. Page 30, Section 2.7. In the last sentence, the term restricted area is used. Restricted area was removed from Figure 3-1 and is not defined anywhere.

    RECOMMENDATION: Define this term or remove it.

15. Pages 31 and 32, Section 2.8.1 (4) uses the measurement “gamma exposure rates in millirem/per hour” where in tables 2-5 and 2-6 “mR/h gamma” is used.

    RECOMMENDATION: Use consistent terms to reduce confusion; mR/h gamma.

16. Page 32, Table 2-6. The term “Simple Decontamination” should be used to clarify the screening process for people in the Recommended Action column, Before Decontamination row.

    RECOMMENDATION: Add the term Simple Decontamination

17. Page 35, Section 3.3. The third paragraph down references the basis for the PAG value in the prior PAG manual.
RECOMMENDATION: Insert those basis discussions in the new PAG manual.

18. Page 35, Footnote 21 cites the 1998 FDA PAGs.

    RECOMMENDATION: Insert (return) the 1998 FDA PAGs to the manual.

19. Page 35, Section 3.3. The 50 year dose PAG has been removed. It provided additional long term safety for the public. No reasoning is provided for its removal.

    RECOMMENDATION: Return the 50 year dose PAG.

20. Page 36, Table 3-1, Footnote c. Remove this footnote as it is not achievable during the ingestion or intermediate phase of the emergency. Removal of soil would require much more explanation.

    RECOMMENDATION: Remove the statement "minor removal of soil from spots where radioactive materials have concentrated".

21. Pages: 37, Section 3.3.2. New terminology: The term Restricted Zone has been replaced with Relocation Area. The terms Restricted Zone helps to clearly define an area that has a hazard (and therefore requires limitations and/or controls) and it is easily understood by the general public and non-technical responders.

    RECOMMENDATION: Use the term Restricted Zone.

22. Page 42, Section 3.5 second paragraph. Drinking water PAG. The EPA should include a drinking water PAG into this manual. Use the standard NPDWR 4mrem/year based on lifetime exposure as the standard.

    RECOMMENDATION: Include a drinking water PAG utilizing the NPDWR 4 mrem/year standard.

23. Page 51, Section 4.4.1. The transition from intermediate phase to late phase cleanup is much like the transition from emergency operations to recovery operations. There is no clear dividing line where one ends and the other begins and there is a time where these activities occur concurrently. The law designates different lead agencies as responsible for leading the response and cleanup efforts. While the priority should be the intermediate phase activities for protection of human health, considerations of long term cleanup should be made in the decision making process. This becomes important for public information, resource management, laboratory prioritization, etc. All decisions should be coordinated and decisions for cleanup should not be made independently between a response group and a cleanup group.

RECOMMENDATION: Discuss the use of Unified Command and coordination of decision making responsibility, resources, and facilities during the transition from the Intermediate to Late Phase Cleanup.

24. Page 53, Section 4.1.3. The paragraph starting with "Community..." The discussion that recommends using a range of one in a population of then thousand to one in a population of one million excess cancer incidence outcomes is generally considered protective for both chemical and radioactive carcinogenic contaminant exposures." This should be converted into a PAG for recovery and not presented as an option.

    RECOMMENDATION: Make this discussion into a PAG for recovery.

25. Pages 55 – 59, Section 4.1.6. Why provide an example? The example is subjective, situational, and based on unrealistic assumptions. Each and every situation where wide spread contamination is present will be different.

    RECOMMENDATION: Remove the example. The concepts that support the example have been sufficiently discussed.

26. Page 59, Section 4.2. The primary decisions fall to state and local officials on waste management, however the capacity and responsibility to effect that waste management falls to the federal government. No authority exists at the state level to establish a radioactive waste facility, only federal authorities can allow legally.

    RECOMMENDATION: Following the sentence on state and local decisions add "the federal government has the responsibility to develop the capacity for large scale radioactive waste management.

27. Page 64, last bullet on the page starting with "It is anticipated..." This statement is speculative and only the federal government can approve the creation of a radioactive waste facility.

    RECOMMENDATION: Remove this bullet.

28. Consider adding the following terms to the Glossary:

    Early Phase, Intermediate Phase, Late Phase – Page 5 lists all three and gives definition so it might be appropriate to also add these to glossary.

    Cloudshine – Page 7 mentions both groundshine and cloudshine in the lower portion of Table 1-1. Groundshine is listed in the glossary but cloudshine is not.

    Shelter-in-Place – Page 7 lists shelter-in-place as a protective action recommendation and should be listed in glossary.

29. Consider adding the following to the list of Acronyms:

Sv and rem – Listed on page 7 and throughout document.

REMM – Radiological Emergency Medical Management mentioned on page 28.

RESRAD-RDD – Mentioned on Page 46.

NDRF – National Disaster Recovery Framework mentioned on page 55.

PCB's – Mentioned on page 62.

DIL – Derived Intervention Level listed in glossary but not in acronyms list.

REM – roentgen equivalent man listed in glossary but not in acronyms list.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION
SECRETARY

July 10, 2013

Air and Radiation Docket and Information Center
Environmental Protection Agency
Mail Code: 6102T
1200 Pennsylvania Ave., NW
Washington, DC 20460

Attention: Docket ID No. EPA-HQ-OAR-2007-0268

Re: Comments on EPA's 2013 PAG Manual – Protective Action Guides and Planning Guidance for Radiological Incidents

To Whom It May Concern:

In 78 FR 22257, the Environmental Protection Agency (EPA) announced availability of the document, "2013 PAG Manual – Protective Action Guides and Planning Guidance for Radiological Incidents" (2013 PAG Manual) for interim use and public comment. The 2013 PAG Manual is intended to update the guidance provided by EPA in the 1992 Manual of Protective Action Guides and Protective Actions for Nuclear Incidents (1992 PAG Manual), EPA 400-R-92-001, May 1992.

The Pennsylvania Department of Environmental Protection (DEP) has reviewed the revised 2013 PAG Manual and wishes to submit the following comments:

A. Issues Across the Scope of the Entire PAG Manual:

1. Reliance on FRMAC Resources and NRC RASCAL in Place of Tables Found in 1992 PAG Manual: Section 3.4.2 and 3.4.3 (p. 40-43): The 1992 PAG Manual contained numerous tables of Dose Conversion Factors (DCFs), Derived Response Levels (DRLs), and conversions from deposition to dose rate, to assist State and Local agencies in evaluating accident conditions. These tables are absent from the 2013 PAG Manual, and instead users are referred to the Federal Radiological Monitoring and Assessment Center (FRMAC) and Nuclear Regulatory Commission (NRC) resources.

   DEP strongly believes that the 2013 PAG Manual should incorporate the applicable tables of DCFs, DRLs, and conversions from deposition to dose rate. State and Local governments need a readily accessible, authoritative source of this information included with the PAG guidance. Our plans and procedures need to state explicitly what DCFs, DRLs, and conversions from deposition to dose rate will be used in accident/emergency conditions to evaluate the situation. Removing these tables from the 2013 PAG Manual will result in uncertainty and ambiguity over the best values to use, and cause confusion and delay in evaluating accident/emergency conditions.

2. No PAG for Drinking Water: Section 1.4.3 (p. 8-10), Section 3.5 (p. 42-45): The 2013 PAG Manual refers to the National Primary Drinking Water Regulations (NPDWR) for Radionuclides for standards for Drinking Water. The 2013 PAG Manual does not provide PAGs for drinking water. The 2013 PAG Manual solicits input on PAGs for Drinking Water.

provide PAGs for drinking water. The 2013 PAG Manual solicits input on PAGs for Drinking Water.

As demonstrated during the 2011 Fukushima nuclear power plant accident, reliance on the NPDWR levels for accident conditions is not feasible. A drinking water PAG for accident/emergency conditions is needed.

It is of great concern that, after 21 years since the issuance of the 1992 PAG Manual, the EPA still has not issued PAGs for drinking water for accident/emergency situations and is only now soliciting input to aid it in the development of drinking water PAGs. In 73 FR 45029, "Planning Guidance for Protection and Recovery Following Radiological Dispersal Device (RDD) and Improvised Nuclear Device (IND) Incidents," (Federal Emergency Management Agency (FEMA), Department of Homeland Security, August 1, 2008) in Table 1, a PAG for Drinking Water Interdiction of 0.5 rem projected dose in the first year was stated.

DEP strongly recommends EPA examine the RDD/IND guidance from 73 FR 45029 and the PAGs for food interdiction issued by the U.S. Food and Drug Administration (FDA), and issue a drinking water PAG consistent with the RDD/IND guidance and FDA's food interdiction PAG.

B. Chapter 2 – Early Phase

3. Administration of KI: Section 2.3.4 (p. 19-20) contains a discussion of KI administration. The 2001 FDA Guidance was complex, and simplified guidance would be welcome. However, the 2013 PAG Manual does not provide clear, simplified guidance on administration of KI. The discussion in the 2013 PAG Manual would benefit from the inclusion of a table specifying EPA's recommendations in terms of radiation dose for administration, age of the individual, and milligrams of KI to be given.

4. Skin and Thyroid PAGs Removed: The 2013 PAG Manual drops the skin and thyroid PAGs for evacuation. It is not clear what criteria EPA used in making this decision. States cannot evaluate the EPA's decision without having the details of how EPA arrived at this decision. EPA should provide a detailed analysis of how the decision to drop the skin and thyroid evacuation threshold was made.

C. Chapter 3 – Intermediate Phase

5. Removal of 50-Year Relocation PAG: DEP supports the removal of the 50-year Relocation PAG.

6. Combined Intermediate Phase PAG: DEP would support the development of a new combined Intermediate Phase PAG, considering all exposure pathways. The development of such a PAG would simplify decision making.

D. Chapter 4 – Late Phase

7. Planning Guidance for Late-Phase Cleanup: The planning guidance on Late-Phase Cleanup in Section 4.1 (p. 51-59) is of modest value as a general reference. It sketches

the broad issues involved in cleanup. No numerical cleanup criteria or limits are provided. DEP believes that State plans addressing Late Phase Cleanup will not be more specific than the outline provided in the 2013 PAG Manual, since cleanup decisions and criteria will be decided by Federal, State and Local authorities collaborating together.

8. Radioactive Waste Disposal: Section 4.2 (p. 59-68) restates EPA's position that "Primary responsibility for waste management decisions falls to state and local officials." A large radiological release, such as one resulting from a nuclear power plant accident, RDD, or IND, could generate massive amounts of radioactive waste, far beyond the ability of any state or local government's ability to manage or afford. EPA needs to develop a realistic strategy for addressing the radioactive waste issue, instead of simply declaring that state and local governments are responsible. We are unaware of any state or local government that has embraced that responsibility.

E. Other Items:

9. Nomenclature of Dose Terms: Section 2.4 (p. 22), Appendix B (p. 74-77): The 2013 PAG Manual uses a nomenclature for Dose Terms different from that used in the 1992 PAG Manual (and different from 10 CFR Part 20).

1992 PAG Manual (and 10 CFR Part 20)	2013 PAG Manual
Total Effective Dose Equivalent (TEDE)	Total Effective Dose (TED)
Committed Effective Dose Equivalent (CEDE)	Committed Effective Dose (CED)
Effective Dose Equivalent (EDE)	Effective Dose (ED)
Committed Dose Equivalent (CDE)	None – (Does use 'Thyroid Equivalent Dose' in Table 1-1 (page 7))

Also, Table 1-1 does not make clear that the PAG dose numbers are in terms of Total Effective Dose (TED) [formally Total Effective Dose Equivalent (TEDE)].

DEP believes that the use of a nomenclature for dose terms in the 2013 PAG Manual that is different from that used in the 1992 PAG Manual and 10 CFR Part 20 is unnecessary and could be confusing to those not familiar with new international nomenclature. DEP recommends the 2013 PAG Manual use dose terms consistent with those used in the 1992 PAG Manual and 10 CFR Part 20. The new nomenclature can be used when [if] NRC, Department of Energy, EPA and Occupational Safety and Health Administration's respective radiation protection regulations are updated and codified as final.

10. Recommended Surface Contamination Screening Levels: Table 2-5 (p. 32): The 2013 PAG Manual lists Recommended Surface Contamination Screening Levels as a multiple of background (typically < or > 2x existing background). FEMA REP-22, "Contamination Monitoring Guidance for Portable Instruments Used for Radiological Emergency Response to Nuclear Power Plant Accidents," (FEMA, October 3, 2002) gives guidance on Surface Contamination Screening Levels that are in counts per minute (cpm). The 2013 PAG Manual and FEMA REP-22 are not consistent in this area.

In this case, the FEMA REP-22 guidance is more helpful. It states contamination limits in terms of cpm, which is the unit used for evaluation of surface contamination. DEP recommends EPA examine its surface contamination screening levels, and ensure they are consistent with the FEMA REP-22 guidance.

11. <u>2 Rem First-Year Relocation PAG Adequate for Children and Fetuses</u>: Section 3.3.1 (p. 36): The 2013 PAG Manual states that the 2 rem First-Year Relocation PAG provides adequate protection for children and fetuses. The 1992 EPA PAG Manual, Section E2.1.2, recommends that pregnant women be relocated if the projected dose during pregnancy cannot be reduced below 0.5 rem. For this reason, Pennsylvania currently uses a First-Year Relocation PAG of 0.5 rem. DEP asks EPA to provide a detailed explanation as to why the EPA now believes a 2 rem First-Year Relocation PAG provides adequate protection for a child and/or a fetus.

Thank you for the opportunity to provide comments on the PAG Manual. Should you have any questions or need additional information, please contact Vincent J. Brisini, Deputy Secretary for Waste, Air, Radiation and Remediation, by e-mail at vbrisini@pa.gov or by telephone at 717.772.2724. You may also contact David J. Allard, CHP, Director of the Bureau of Radiation Protection, by e-mail at djallard@pa.gov or by telephone at 717.787.2480.

Sincerely,

E. Christopher Abruzzo
Acting Secretary

OAR-2007-0268 p. 1

Air and Radiation Docket

EPA – Mail Code 6102T

1200 Pennsylvania Ave NW

Washington, DC 20460

JUL 30 2013

19 July, 2013

We were informed that the EPA will reissue guidelines KI prophylaxis in case of reactor accidents. To my reading there are some unfortunate changes in the current version of the PAG which require return to previous versions published by the FDA, and similar recommendations published by the National Council on Radiation Protection, and by virtually all thyroid specialists in the US, Europe or Japan. These will be mentioned below. I have worked on the mechanism of KI-induced inhibition of the thyroid gland for many years and the efficacy and safety of thyroid blockade have been confirmed by nearly all thyroid specialists interested in these questions. Such studies are independent of the nuclear industry or its allies at the NRC.

If we are ever to succeed in CO2 mitigation, nuclear energy will likely play a major role. Yet there is world-wide distrust of the industry because of accidents, re-approval of ancient reactors, failure to deal with spent fuel disposal, and the seemingly cavalier attitude toward public safety even to a minor step such a protection against radioiodine fallout. It is thus important to deal with these issues. While a number of these are difficult, KI-based protection is not; it is cheap, effective, and safe.

Only one study exists on the safety of mass distribution of KI (Nauman, J. & Wolff, J. Am. J. Med. 94:524-532, 1993) and this should be mentioned. From that it is clear that the benefit/risk ratio is very high. Moreover, the statement that people with Graves' disease, *multi*nodular goiter (not nodules) or Hashimoto's thyroiditis should **not** take KI should be modified to read "should be apprised of possible side reactions" when high level contamination by radioiodine change that balance between risks. E.g. a possible transient episode of hypothyroidism after KI is preferable to a possible thyroid cancer. Furthermore, since leaks may persist or recur, repeat dosing may be required. Similar reasoning applies to pregnancy and lactation. Thus, if anything, the FDA guidelines should be strengthened no weakened.

JUL 23 2013

Other points should be clarified or discussed. Because speed of response is critical, pre-distribution of KI is essential. For this, foil-wrapped KI is ideal. It is cheap, has a very long shelf-life (and a 5-10% loss will not matter), and distribution can be handled by public health authorities. As for the 10 mile distribution radius, it is obviously too small despite objections from the nuclear industry. (E.g. rare gas isotopes from TMI reached Buffalo, NY in 24 hours and Chernobyl contamination reached Sweden in a similar time frame). This old controversy may seem beyond the scope of the present PAG but remains a critical part of KI protection.

It remains incomprehensible to me and many others in the thyroid field why the nuclear industry, with its bad reputation, keeps fighting a simple, effective and inexpensive measure to protect public health, even if it were done only for public relations. The EPA, on the other hand, exists to protect the public and should insist on the strongest proposals for thyroid gland protection as established by literally hundreds of thyroid specialists.

Thank you for your attention,

Jan Wolff

Jan Wolff MD, PhD

7917 Deepwell Dr.

Bethesda, MD. 20817

Page	Table/ Appendix	(E)dit/ (Q)question/ (C)omment	Comment
9		E	"for out years" is not intuitive phrasing, consider rephrasing. Perhaps, "for alternate years."
9		Q	"0.5 rem... in any subsequent year" and "0.5 rem… the second year and beyond" Used to be for just for the 2nd year we would calculate. How many subsequent years should we calculate for the PAG? 5th year? 10th year? Or until the DIL is below a certain level?
10		C	"EPA is seeking input on an approach and technical rationale for a drinking water PAG." Yes, a drinking water PAG should be implemented. However, a guidance document is not the place to be "seeking input." If input is received and then put into the final document, the public will not have the opportunity to comment on the new information.
12		Q	What "incident specific circumstances?"
13		Q	Does Rascal "project doses for four days?"
15	2-1	Q	This table shows the PAG as 1-5R. It does not state whether this is for TEDE, CDE(thyroid), or something else.
15	2-1	Q	Will FEMA accept plans that do not provide KI at 5R? For example, if emergency workers currently receive KI at 25R, this document is "guidance" and not "mandatory," can the 25R be used instead of the 5R?
15		C	"The basis for the PAGs for the early phase is given in Appendix C of the 1992 PAG Manual, available online as a historical reference…" The new PAG Manual is meant to supersede the 1992 manual. The 1992 manual should not be considered a reference. If the basis needs to be referenced, include it as an appendix in the new manual.
15		Q	"This conclusion was based primarily on EPA's determination concerning acceptable levels of risk of health effects from radiation exposure in an emergency situation, while weighing costs and risks associated with any protective action." How did EPA determine what the acceptable levels of risks were?
16		Q	How do you predict "potential failure scenarios" such as a "fire in the structure?" If you begin to take into account all of the things that could possibly happen that would cause "unavoidable dose," you'd never let anyone evacuate or shelter in place!
16		Q	What conditions would justify evacuation at conditions under 1R ?
17		Q	"Shelters should be opened to vent any airborne radioactivity trapped inside…" If "venting" is an important process, then why is it not recommended for other people sheltered in place, such as homes and businesses? Also, shelters should be beyond the 10-mile EPZ. How much "airborne radioactivity" will they experience?
18		E	"Regardless of size, large or small" - "Large or small" is not necessary to this sentence.
18		Q	Were there no casualties due to a "direct result of the evacuation" from Katrina? Or were the evacuation casualties not as big as Rita's were?
20		Q	Does the 5R KI intervention level apply to emergency workers?

20		Q	The 1998 FDA guidance states nothing about the FDA understanding that during a radiological emergency it will be "logistically difficult" to administer varying doses of KI to the population. How do we know that the FDA understands? Does EPA just assume that FDA must understand that problem?
21		C/Q	EPA should not be telling non-NPP sites that they should develop EPZs and send material to the public with the EPZ regularly. If the regulating authority of that site sees fit, then guidance should be developed and perhaps new rules to be created. Do you make the EPZs conform, or do you have different facilities with EPZs of 1-mi, 3-mi, 8-mi, etc? Do you create an ingestion planning zone guidance? If yes, do you have different IPZs based on the variable EPZ? Do the facilities need to put out agricultural brochures to farmers within the IPZ? Who will develop the guidance for this? Will it be regulated? By who?
26	2-2	Q	The 5R activity should not be referred to as "all occupational exposures." We are talking emergency response, a one time dose. It has nothing to do with occupational exposure. "Occupational exposure" is referred to throughout the document. There are only a few instances where this is applicable.
26		Q	What is a "sub-chronic" risk? Would that be acute?
27	2-2[b]	Q	Why should incident commanders raise "the property and lifesaving response worker guidelines?" What is the thought process here? You don't need to "raise" the limits. 25R should remain the limit for lifesaving. By leaving it as such, EW, who go into situations where >25R is possible, should be told the risks and remain volunteers.
28		Q	EW should be provided a "thorough" explanation of the risks with exposures >5R. How thorough is "thorough?" It is possible to do JIT and do a thorough job?
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1/4		Q	What "brief planning guides" are you referring to? If it's within the manual, it needs to be clarified
4/12		Q	We cannot review the referenced document "…Publication 60 series…" because it must be purchased. Can you describe how the dosimetry for the PAGs was updated?
5/6		C	The reference to the Early Phase in the second paragraph seems to contradict the description on page 5. Page 6 indicates the phase begins earlier than when the protective actions start. The "Early Phase" description on page 5 indicates the beginning of the phase is when protective actions are first required. To us, that says the Early Phase doesn't start until either Alert or possibly as late as the SAE.
27/28	2-3	E	You have plenty of room to change "h" to "hr." If you must split the table across pages, do not split a row and add a header to the 2nd page. Keep the ">" next to the "20 h."
27/28	2-2/2-3	E	Do not split tables across pages. If you must, then put the header on both pages
67/68		Q	Why mention "use of withdrawn lands to manage radiological waste would violate those statutes?" If there is no possibility for the Secretary of DoD to make an exception to this like the previous example, why mention it?
cover		Q	Should we refer to the document as the PAG Manual and no longer reference EPA 400'
		C	A lot of this document is not guidance on protective actions. It is more a white paper on how to go about planning and managing an event and it's progression.
		Q	I contacted a group asking how to get TurboFRMAC because I couldn't find a link. They wrote back that the "program seems to be discontinued by the developer." How can I get a copy of TurboFRMAC? And if it is truly discontinued, should you use it as a recommended dose projection software?
		Q	If this is a "draft for **interim use** and public comment," should we be following this guidance now?
		Q	The 5R emergency worker limit is repeatedly referred to as the "general occupational guideline." Any part of the emergency worker's 5R dose does not count towards a person's yearly occupational exposure. It is supposed to be a "one time" dose. By referencing the occupational exposure, it makes it sound like I will have to not only track an EW exposure, but I will have to also find out where they are in their occupational exposure and add the two together. I do not believe that is the intent, but it sounds like the 5R occupational and emergency are one and the same. It is confusing.
			EPA is the "coordinating agency" for certain scenarios, as noted in the NRF Nuclear/Radiological Annex. They are not the lead agency for basically anything under DOE, DHS, DOD, USCG, or NRC. Why are they speaking to DOE disposal sites and such?
			I don't understand why the EPA PAG Manual is telling us that we have include stakeholders? Or that we need to be using NRF/NIMS?

Page	Table/ Appendix	(E)dit/ (Q)question/ (C)omment	Comment
9		E	"for out years" is not intuitive phrasing, consider rephrasing. Perhaps, "for alternate years."
9		Q	"0.5 rem... in any subsequent year" and "0.5 rem… the second year and beyond" Used to be for just for the 2nd year we would calculate. How many subsequent years should we calculate for the PAG? 5th year? 10th year? Or until the DIL is below a certain level?
10		C	"EPA is seeking input on an approach and technical rationale for a drinking water PAG." Yes, a drinking water PAG should be implemented. However, a guidance document is not the place to be "seeking input." If input is received and then put into the final document, the public will not have the opportunity to comment on the new information.
12		Q	What "incident specific circumstances?"
13		Q	Does Rascal "project doses for four days?"
15	2-1	Q	This table shows the PAG as 1-5R. It does not state whether this is for TEDE, CDE(thyroid), or something else.
15	2-1	Q	Will FEMA accept plans that do not provide KI at 5R? For example, if emergency workers currently receive KI at 25R, this document is "guidance" and not "mandatory," can the 25R be used instead of the 5R?
15		C	"The basis for the PAGs for the early phase is given in Appendix C of the 1992 PAG Manual, available online as a historical reference…" The new PAG Manual is meant to supersede the 1992 manual. The 1992 manual should not be considered a reference. If the basis needs to be referenced, include it as an appendix in the new manual.
15		Q	"This conclusion was based primarily on EPA's determination concerning acceptable levels of risk of health effects from radiation exposure in an emergency situation, while weighing costs and risks associated with any protective action." How did EPA determine what the acceptable levels of risks were?
16		Q	How do you predict "potential failure scenarios" such as a "fire in the structure?" If you begin to take into account all of the things that could possibly happen that would cause "unavoidable dose," you'd never let anyone evacuate or shelter in place!
16		Q	What conditions would justify evacuation at conditions under 1R ?
17		Q	"Shelters should be opened to vent any airborne radioactivity trapped inside…" If "venting" is an important process, then why is it not recommended for other people sheltered in place, such as homes and businesses? Also, shelters should be beyond the 10-mile EPZ. How much "airborne radioactivity" will they experience?
18		E	"Regardless of size, large or small" - "Large or small" is not necessary to this sentence.
18		Q	Were there no casualties due to a "direct result of the evacuation" from Katrina? Or were the evacuation casualties not as big as Rita's were?
20		Q	Does the 5R KI intervention level apply to emergency workers?

20		Q	The 1998 FDA guidance states nothing about the FDA understanding that during a radiological emergency it will be "logistically difficult" to administer varying doses of KI to the population. How do we know that the FDA understands? Does EPA just assume that FDA must understand that problem?
21		C/Q	EPA should not be telling non-NPP sites that they should develop EPZs and send material to the public with the EPZ regularly. If the regulating authority of that site sees fit, then guidance should be developed and perhaps new rules to be created. Do you make the EPZs conform, or do you have different facilities with EPZs of 1-mi, 3-mi, 8-mi, etc? Do you create an ingestion planning zone guidance? If yes, do you have different IPZs based on the variable EPZ? Do the facilities need to put out agricultural brochures to farmers within the IPZ? Who will develop the guidance for this? Will it be regulated? By who?
26	2-2	Q	The 5R activity should not be referred to as "all occupational exposures." We are talking emergency response, a one time dose. It has nothing to do with occupational exposure. "Occupational exposure" is referred to throughout the document. There are only a few instances where this is applicable.
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21[10]		C/Q	If NPPs are required to be prepared for hostile actions, then towns where nuclear propulsion vessels dock should consider the same preparations. It seems like a naval vessel would be just as likely a target for hostile actions. What radiation levels would be released if a nuclear naval vessel was bombed? Would it be enough to be of concern to the general population in the area? What distances could deposition occur, is it far enough to be of concern to the agricultural community?
1/4		Q	What "brief planning guides" are you referring to? If it's within the manual, it needs to be clarified.
4/12		Q	We cannot review the referenced document "…Publication 60 series…" because it must be purchased. Can you describe how the dosimetry for the PAGs was updated?
5/6		C	The reference to the Early Phase in the second paragraph seems to contradict the description on page 5. Page 6 indicates the phase begins earlier than when the protective actions start. The "Early Phase" description on page 5 indicates the beginning of the phase is when protective actions are first required. To us, that says the Early Phase doesn't start until either Alert or possibly as late as the SAE.
27/28	2-3	E	You have plenty of room to change "h" to "hr." If you must split the table across pages, do not split a row and add a header to the 2nd page. Keep the ">" next to the "20 h."
27/28	2-2/2-3	E	Do not split tables across pages. If you must, then put the header on both pages.
67/68		Q	Why mention "use of withdrawn lands to manage radiological waste would violate those statutes?" If there is no possibility for the Secretary of DoD to make an exception to this like the previous example, why mention it?
cover		Q	Should we refer to the document as the PAG Manual and no longer reference EPA 400?
		C	A lot of this document is not guidance on protective actions. It is more a white paper on how to go about planning and managing an event and it's progression.
		Q	I contacted a group asking how to get TurboFRMAC because I couldn't find a link. They wrote back that the "program seems to be discontinued by the developer." How can I get a copy of TurboFRMAC? And if it is truly discontinued, should you use it as a recommended dose projection software?
		Q	If this is a "draft for **interim use** and public comment," should we be following this guidance now?
		Q	The 5R emergency worker limit is repeatedly referred to as the "general occupational guideline." Any part of the emergency worker's 5R dose does not count towards a person's yearly occupational exposure. It is supposed to be a "one time" dose. By referencing the occupational exposure, it makes it sound like I will have to not only track an EW exposure, but I will have to also find out where they are in their occupational exposure and add the two together. I do not believe that is the intent, but it sounds like the 5R occupational and emergency are one and the same. It is confusing.
			EPA is the "coordinating agency" for certain scenarios, as noted in the NRF Nuclear/Radiological Annex. They are not the lead agency for basically anything under DOE, DHS, DOD, USCG, or NRC. Why are they speaking to DOE disposal sites and such?
			I don't understand why the EPA PAG Manual is telling us that we have include stakeholders? Or that we need to be using NRF/NIMS?

Utility Radiological Safety Board of Ohio

September 4, 2013

Per the Federal Register announcement of April 15, 2013 I am submitting comments on the revisions to the Protective Action Guidance Manual on behalf of the Utility Radiological Safety Board of Ohio.

- On page 41 the PAG manual refers the reader to the 1992 PAG Manual to see calculations related to the calculation of the ingestion phase limits of 2 REM for the first year limit and 0.5 REM for subsequent years. Adding these calculations to the new PAG Manual as an attachment or appendix would capture the related information in a single place for ease of use.

- On page 42 **Section 3.5 Protective Action Guidance for Food and Drinking Water**

  EPA should recommend a PAG based upon known and measurable health effects resulting from exposure to radiation (e.g., . Chernobyl). With the extreme uncertainties of health risks resulting from such low level doses, it is highly inappropriate to set a limit of 4 mRem/yr, inclusive of background, as the drinking water guidance during a radiological emergency. A more reasonable approach would be to treat water as food and use the Derived Intervention Level set by the US FDA, especially given that the increased rate of child thyroid cancer at Chernobyl was due to consumption of contaminated food stuff. Emphasis should also be given to an explanation that this limit does not apply to surface water, such and lakes, ponds, streams or reservoirs, but only applies to potable water.

  Below is supporting documentation, from IAEA Safety Guide No. GS-G-2.1

  STOCHASTIC EFFECTS

  2.8. Only the exposure of many tens of thousands of people to whole body doses in the range of 100–200 mSv [10 – 20 rem] or of many tens of thousands of children to thyroid doses of the order of 50 mSv [5 rem] (i.e. at dose rates thousands of times higher than those due to background levels of radiation) could result in a detectable increase in the incidence of cancer among those population groups exposed. Even emergencies that have led to the exposure of very large groups of people (e.g. the Chernobyl accident) who received doses well above those due to background levels of radiation have not resulted in a detectable increase in the incidence of solid cancers among those exposed. [6]

  2.9. Typically, following a nuclear or radiological emergency a number of people (not all of whom may be experts) will make estimates of a radiation induced increase to be

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expected in the incidence of cancers and other effects (e.g. birth defects) that may appear among those population groups who were exposed to radiation as a result of the emergency. Such stochastic health effects would not be individually attributable to radiation exposure (as they could not be distinguished from health effects with other causes). Estimates of consequences for a population may be made on the basis of the collective radiation dose (i.e. the sum total of all individual doses in an exposed population, expressed in man-sieverts) and levels of radiation health risks derived from observations made on exposed population groups who received high radiation doses (e.g. survivors of the atomic bombing in Japan). However, health consequences to be expected are generally estimated for people who have received only low radiation doses. In estimating such health consequences certain assumptions have to be made because of scientific uncertainties concerning the biological effects of radiation exposure at low doses and low dose rates. For the purposes of the system of radiation protection the assumption is made that there is no threshold level of radiation dose below which there is no associated radiation risk. This is only an assumption, however; data on radiation health risks that are yielded by studying the effects of exposure at high doses are not directly applicable for low dose exposure. Moreover, the very small projected increases in the incidence of cancers among those people exposed with such low levels of dose would in any case be undetectable epidemiologically against the fluctuations in the spontaneous incidence. Incautious estimates of the health effects of low dose exposures have led to what many consider is an exaggerated view on the part of the public of the risks associated with radiation, and consequently in inappropriate and, in some cases, counterproductive and harmful 'protective' actions being taken by the public and by officials. Risks of stochastic effects occurring as a result of low radiation doses (e.g. lower than 100 mSv) that are quantified for the purposes of radiation protection should therefore be interpreted for and communicated to the public with great caution, if at all. Any such quantification should be accompanied by a plain language explanation that makes it clear that, for such low doses, any radiation induced increase in the incidence of health effects in a population would be inherently very difficult, if not impossible, to detect. This plain language explanation should also discuss the risks and consequences of any actions taken to reduce the risks associated with exposure. If others (e.g. official or unofficial parties within or outside the State) make such estimates, consideration should be given to providing a clear explanation that puts these estimates in perspective.

[6] As of 2000 no excess solid cancers had been observed among the approximately 200 000 people who performed recovery operations within the 30 km zone in 1986–1987 where the highest doses were received following the Chernobyl accident. However, a major increase was detected in the incidence of thyroid cancer among those persons who had received radiation doses as a fetus or child following the Chernobyl accident. This detectable increase in incidence in this population group was due to a very large release of radioiodine, resulting in high thyroid doses in hundreds of thousands of children (primarily due to the consumption of contaminated milk and leafy vegetables). This radiation induced rise in cancer incidence was easily detected epidemiologically because of the very low spontaneous rate of thyroid cancers among the children.

2.10. One of the important goals of emergency preparedness is to prevent, to the extent practicable, the occurrence of stochastic effects. Since it is assumed that any dose, no matter how small, can increase the risk of occurrence of a stochastic effect, ***it would be impracticable and probably harmful to attempt to reduce the dose, and thus its associated***

risk, resulting from an emergency to near zero. In fact, some actions taken to reduce the risk of stochastic effects (e.g. relocation from an area with insignificant levels of contamination) may do more harm than good. *The difficulty lies in determining what is practicable and reasonable. To address this issue, international standards provide generic intervention and action levels at which various protective measures would be justified on radiation protection grounds [2].* ***Taking protective action at levels significantly below these levels could do more harm than good.***

IAEA Safety Guide No. GS-G-2.1
Arrangements for Preparedness for a Nuclear or Radiological Emergency

NOTE: Emphasis is added to the original documentation.

- Section 4.6.1 on page 55 provides an example of the late phase following an incident based on a radiological dispersal device (RDD) scenario. This scenario assumes the federal government will be the source of funds for the recovery effort. An example based on a nuclear power accident with a discussion of the fiscal roles played by the utility, American Nuclear Insurers (ANI), and the federal government would be helpful.

- Page 58 of the PAG manual discusses the establishment of technical and stakeholder working groups to advise/concur with proposed clean-up actions. Assuming a nuclear power plant accident, does the guidance envision including utility representatives in these working groups?

Sincerely,

Nancy J. Dragani, Chair
Utility Radiological Safety Board

NJD:mlb

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American Water Works Association

Government Affairs Office
1300 Eye Street NW
Suite 701W
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T 202.628.8303
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September 10, 2013

U.S. Environmental Protection Agency
Air and Radiation Docket and Information Center
Mail Code: 6102T
1200 Pennsylvania Ave NW.
Washington, DC 20460

RE: Updates to Protective Action Guides Manual: Protective Action Guides (PAGs) and Planning Guidance for Radiological Incidents, Docket ID No. EPA–HQ–OAR–2007–0268

Dear Sir or Madam,

The American Water Works Association (AWWA) is an international, nonprofit, scientific and educational society dedicated to providing total water solutions assuring the effective management of water. Founded in 1881, the Association is the largest organization of water supply professionals in the world. Our membership includes more than 4,000 utilities that supply roughly 80 percent of the nation's drinking water and treat almost half of the nation's wastewater. Our 50,000-plus total membership represents the full spectrum of the water community: public water and wastewater systems, environmental advocates, scientists, academicians, and others who hold a genuine interest in water, our most important resource. AWWA unites the diverse water community to advance public health, safety, the economy, and the environment.

In response the request for comments issued April 15, 2013, 78 FR 22257, regarding the *Protective Action Guides and Planning Guidance for Radiological Incidents*, AWWA is submitting comments focused on drinking water as specified below (EPA comment request in bold):

1. ***EPA is seeking input on an approach and technical rationale for a drinking water PAG designed to help officials select protective actions under emergency conditions when exposures would occur over shorter time periods than those envisioned in the National Primary Drinking Water Regulation (NPDWR).*** (3.5. Protective Action Guidance for Food and Drinking Water, page 42)

Rather than relying on drinking water regulations with regard to a potential intermediate phase PAG for drinking water, the Agency should consider the following approach:

- Establish PAGs for drinking water consistent with PAGs for food interdiction; i.e., 0.5 rem/yr (500 mrem/yr) during the intermediate period. This could be applied in limited situations when alternative water sources are inadequate or otherwise compromised.
    - For ^{131}I, with a concentration of 3 pCi/L (= 4 mrem/yr), the average concentration over a year giving a dose of 500 mrem would be 375 pCi/L.
    - For ^{137}Cs, with a concentration of 200 pCi/L (= 4 mrem/yr), the average concentration over a year giving a dose of 500 mrem would be 25,000 pCi/L.

- This framework can be compared with the drinking water MCL for beta-photo emitters of 4 mrem/yr and background radiation of ~300 mrem/yr.

- An alternative approach would be to limit the dose to 4 mrem during a short exposure period (e.g., the first 4 days of the early period)
    - For ^{131}I, the concentration of 3 pCi/L (= 4 mrem/yr) for 730 liters drunk over 1 year would be equivalent to 8 liters of water containing 274 pCi/L of ^{131}I consumed in 4 days.
    - For ^{137}Cs, the concentration of 200 pCi/L (= 4 mrem/yr) for 730 liters drunk over 1 year would be equivalent to 8 liters of water containing 18,250 pCi/L of ^{137}Cs consumed in 4 days.
    - This would require explanation from EPA and State officials that this equivalent dosage is acceptable under the emergency conditions.

- For the late phase when recovery actions take place, the use of drinking water regulations (at entry points to the distribution system) would be appropriate.

2. ***To determine if there is radiological contamination of drinking water sources and the extent to which such contamination is occurring, systems sampling for radionuclides must use approved EPA methods.*** (3.5.1. Monitoring & Characterization of Contaminants , page 43)

In an emergency situation, AWWA recommends that EPA allow the methods that are most simple and rapid in order to aid in getting the quickest possible decisions about the safety of the water supply. Methods such as those referenced in *Rapid Radiochemical Methods For Selected Radionuclides In Water For Environmental Restoration Following Homeland Security Events* should be acceptable under emergency conditions. It worth noting that AWWA has previously recommended that the Agency address the variability associated with current drinking water compliance methods (Eaton et al., 2011).[1] Any such determination should be issued in an updated and revised version of *Standardized Analytical Methods for Use During Homeland Security Events*.

[1] Eaton, A., Cha, Y., Geddes, L., & Morley, K.M. (2011). Evaluation of variability in radionuclide measurements in drinking water. *Journal - American Water Works Association*, *103*(5), 119-130.

3. ***During a radiological event, water systems may be dealing with a number of requirements and operating procedures and may not be prepared to issue public notification. The state may issue public notification on behalf of the water system.*** (3.5.2. Public Notification, page 43)

During an emergency, especially one related to a radiological incident, either the State or EPA would presumably take lead responsibility for public notification. This would not be unlike large events such as Superstorm Sandy, where the State was often the principle means for notification for situation awareness, including in the case of water systems informing the public of boil water notices. During such emergencies the water system resources are likely to be strained. Water system focus should be on returning the water supply to a safe condition as soon as possible, and EPA or state authorities should assume responsibility for communicating with the public. However, in conformity with the Incident Command System, the water utility personnel should be involved with and be present during any briefings, press conferences or other any public communications appearances.

4. ***Water distribution systems all incorporate reserve and storage capacity. During the early phase of an incident it is unlikely that contamination could affect water which is directly available for consumption through distribution systems. It would take some time for radionuclides to be deposited from the plume into the supply system water source and then subsequently be distributed. During the early phase, recommendations to the public (i.e., about drinking tap water) should reflect these considerations. The public should be advised that the water is safe to drink unless otherwise informed by state officials. Some useful and practical actions water systems can take during the intermediate phase to provide drinking water to customers are described below.*** (3.5.3. Corrective Actions to Reduce Levels of Contamination, page 43-45)

We question the assumptions that the Agency is making in regards to distribution system reserve/storage capacity as we believe they are naïve. First, not all systems have significant reserve and storage capacity, and the proposal does not account for factors that could be unique to those systems with open finished water reservoirs. It should also be noted that storage capacity will be significantly influenced by the time of day and time of year; therefore the Agency should consider a worst reasonable case scenario where storage is at a minimum and the treatment plant(s) are running at full capacity to meet peak demand. Under such conditions, we believe that it would be prudent to advise the treatment plants to shut down immediately to mitigate potential contamination of the distribution system. AWWA welcomes the opportunity to explore these options further with the Agency and recommends leveraging the approaches outlined in ***Planning for an Emergency Water Supply***, a resource developed collaboratively with the National Homeland Security Research Center.

5. ***From the section "Wait for Flow-By" - During this time, the system's existing storage capacity can be depended upon. If the stored water supplies could be depleted before the affected valves can be reopened, treatment of the contaminated water while using available stored water supplies should be considered. This assumes that the treatment technology will be in place or readily accessible.*** (3.5.3. Corrective Actions to Reduce Levels of Contamination, page 44)

The Agency's assumption is unreasonable, particularly within a large water system. Depending upon the radionuclide of concern, the only treatment options may be membrane filtration or ion exchange. Given the volume of water in some utilities, it should be noted that currently the largest mobile treatment system is a 1 MGD low –pressure membrane filtration unit. That is likely to be inadequate to handle the demand in a larger system. Moreover, such units create questions about the ability to directly pressurize the distribution system.

6. ***From the section "Establish Pipeline Connections to Closest Sources/Systems" - Running a pipeline from a "clean" water supply system to various distribution centers located throughout the affected community is a routine means of providing clean water.*** (3.5.3. Corrective Actions to Reduce Levels of Contamination, page 44)

AWWA collaborated with EPA-NHSRC to develop ***Planning for an Emergency Water Supply*** to address the options and factors that must be considered under emergency circumstances. This option as proposed assumes that a clean source of supply exists, which runs counter to EPA's own analysis as performed by the Environmental Assessment Division of Argonne National Laboratory. The Argonne analysis examines some of the likely impacts on water and wastewater operations. A similar analysis was also performed by the Department of Homeland Security (Porco, 2010).[2] The suggestion also presumes that the impacted community has not self-evacuated or been mandated to evacuate, which significantly alters demand. It should also be noted that running a pipeline to an affected area as suggested will require engineering expertise to select the route, the labor force and equipment to run the line, and likely, a hydraulic model to determine if the pipeline can be effective. These resources may not be available under emergency conditions.

[2] Porco, J.W. (2010). Municipal water distribution system security study: recommendations for science and technology investments, *Journal - American Water Works Association*, *102*(4): 30-32.

7. ***"However, the Agency recognizes a short-term emergency drinking water guide may be useful for public health protection in light of the Fukushima nuclear power plant accident, which impacted some Japanese drinking water supplies. Input on the appropriateness of, and possible values for, an intermediate phase emergency drinking water PAG is being sought during the public review of this Manual."*** (3.5. Protective Action Guidance for Food and Drinking Water, page 42)

AWWA collaborated with EPA-NHSRC to develop ***Planning for an Emergency Water Supply*** to address the options and factors that must be considered under such circumstances. In addition, we would advise EPA to work with CDC and FEMA (www.READY.gov) to ensure messaging is consistent among various federal authorities from whom the public is likely to seek information following such an incident. AWWA has worked also with CDC and EPA to develop the ***Drinking Water Advisory Communication Toolbox*** which should also be considered as another resource to be leveraged.

AWWA believes a meeting with EPA staff to examine this issue in further detail would be beneficial. Please do not hesitate to contact me or Dr. Kevin Morley, kmorley@awwa.org, if you have questions about these comments.

Sincerely,

Tom Curtis
Deputy Executive Director
American Water Works Association

cc: Peter Grevatt, OGWDW
David Travers, OGWDW/WSD

Association of State and Territorial
ASTSWMO
Solid Waste Management Officials

444 North Capitol Street, N.W., Suite 315
Washington, D.C. 20001
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www.astswmo.org

September 13, 2013

Air and Radiation Docket and Information Center
U.S. Environmental Protection Agency
Mail Code: 6102T
1200 Pennsylvania Ave., NW
Washington, DC 20460

Re: Docket ID No. EPA-HQ-OAR-2007-0268
Updates to Protective Action Guides Manual: Protective Action Guides (PAGs) and Planning Guidance for Radiological Incidents

Dear Madam/Sir:

The Association of State and Territorial Solid Waste Management Officials (ASTSWMO) Radiation Focus Group is providing the enclosed comments to the revised 2013 PAG Manual – Protective Action Guides and Planning Guidance for Radiological Incidents. ASTSWMO is an association representing waste management and remediation programs of the 50 States, five Territories and the District of Columbia (States). Our membership includes State waste program experts in the management and regulation of solid wastes. The enclosed comments reflect only the individual comments of the Radiation Focus Group's members and have not been reviewed or adopted by the ASTSWMO Board of Directors or other ASTSWMO Program Subcommittees. In addition, individual State or Territorial waste programs may also provide comments based on their own State perspectives and experiences.

Should you have any questions or require additional information, please contact me at (303) 692-3403.

Sincerely,

For

Jennifer Opila (CO)
Chair, ASTSWMO Radiation Focus Group

cc: ASTSWMO Radiation Focus Group
Dan Schultheisz, U.S. EPA ORIA

<table>
<tr><td rowspan="2">QUESTION 1</td><td>To implement the PAGs, the reader is referred to dose calculations in the Federal Radiological Monitoring and Assessment Center (FRMAC) Assessment Manuals. The Assessment Manuals are updated with current International Commission on Radiological Protection (ICRP) dosimetry models (i.e., ICRP 60 series) and dose coefficients. The FRPCC also encourages the use of computational tools such as DOE's Turbo FRMAC, RESRAD RDD and NRC's RASCAL or other appropriate tools and methods to implement the PAGs. We request comment on the usefulness of this approach and seek feedback on how to facilitate implementation of these methods in emergency management plans.</td></tr>
<tr><td>COMMENTS:

• TURBO FRMAC and subsequent training opportunities should be more easily available (the software is expensive).

• Expanding training opportunities for RESRAD RDD and NRC RASCAL specifically for response organizations is recommended, as CAMEO is periodically made available to response organizations.

• Currently RESRAD appears to be offered as a suite, with training including multiple RESRAD models, not just RESRAD RDD as for the purpose of RDD or IND plume assessments. Taking the whole suite of RESRAD training is quite time consuming. RESRAD RDD could be offered separately via web training.

• The deletion of the EPA-400 era Dose Conversion Factor (DCF) tables, which provided adequate detail and guidance for State and local programs to perform the computations, forces the reliance on FRMAC and RASCAL modeling particularly for intermediate phase dose assessment. The methods used by FRMAC and RASCAL to calculate DCF's have become very complex unlike the former EPA-400 tables that showed DCF's for ground deposition and re-suspension along with clear explanations of their methodology, making it relatively simple for entities to develop their own computational methods using, for example, Excel. Entities (States) will have to invest considerable resources for personnel to learn (most probably Turbo FRMAC) a complex and cumbersome program, at the expense of in-house development and training. In a real event, States may not be able to conduct extensive intermediate (second) phase dose assessment but instead may be limited to their initial assessment, waiting for FRMAC to provide the more extensive assessments.

• EPA has chosen to recommend the use of computational tools such as Turbo FRMAC and RASCAL to calculate values to be compared to the PAGs. While in basic agreement with this concept, it should be</td></tr>
</table>

	made clear that there may be a slight difference in results depending on which model is used.
QUESTION 2	**The Agency recognizes a short-term emergency drinking water guide may be useful for public health protection in light of the Fukushima nuclear power plant accident, which impacted some Japanese drinking water supplies. Input on the appropriateness of, and possible values for, a drinking water PAG is being sought.**
	COMMENTS: • Yes, such guidance is appropriate for inclusion in the PAGs. • In the early phase of the event, EPA MCLs (list of Drinking Water Standards and MCLs table – National Primary Drinking Water Regulations - as suggested in section 3.5 of this document http://water.epa.gov/drink/contaminants/index.cfm#List) should be used when possible. • In *extreme* circumstances only, with the exception of uranium (kidney toxicity), alpha emitters (quality factor 20 - internal hazard), and the radium series, dose assessments could be calculated that would correspond with the dose deemed acceptable for the event by the technical working groups. This information would be communicated by decision makers or their designated public information officers. • Water not meeting drinking water standards should be used for non-ingestion purposes only, such as bathing and cleaning items. • During the intermediate and late phases of an event, safe water should be supplied to the populace for drinking whenever possible. • The threshold for a water standard, especially for the first year, may be too stringent at 4 mRem/yr. FDA limits CDE to 5 rem and an EDE of 500 mrem. Not all the principle radionuclides cited by FDA will have lasting effects on exposure. Chernobyl showed that months after the initial depositions, rivers and reservoirs were generally below guideline limits for safe drinking water. Groundwater was not severely affected because long-lived isotopes were absorbed to surface soils. • The short term emergency drinking water guide may be useful to protect the public, but according to the study conducted by World Health Organization (WHO, 2012), the possibility of getting radionuclides released from a nuclear power plant accident to the tap water is very low. The study assessed only the

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	ingestion of radionuclides through drinking water, and the estimation of radiation dose from the ingestion of tap water has been made based on measured activity concentrations. The study concluded that the dose from ingestion of radionuclides through drinking water from tap is low compare to the dose from other exposure pathways (WHO, 2012). According to this study, the highest effective doses were estimated to be less than 0.1 mSv (10mrem) and the highest thyroid doses were estimated to be at most about 2 mSv (200mrem). In both cases the maximum dose was estimated to be for 6-month-old infants fed on formula milk prepared using tap water. According to this study for tap water, it is not relevant to put PAGs for tap drinking water provided that only tap water is used for drinking. Reference: World Health Organization (2012). Preliminary dose estimation from the nuclear accident after the 2011 Great East Japan earthquake and tsunami. Retrieved from http://whqlibdoc.who.int/publications/2012/9789241503662_eng.pdf • We agree that the final version of the PAG manual should have some guidance for drinking water situations where the event may affect the drinking water supply to an extent the supply is the only water available. During the intermediate phase, a drinking water PAG should be developed using stakeholder input and optimization. It should be an all pathways approach, taking into account the dose received from external exposure and ingestion. What are needed are simple equations (or spreadsheet) that can be used to determine dose, given analytical results of nuclides as input, with EPA-determined intake parameters. This would give the States the tools necessary for a consistent approach for assessing the dose from drinking water. For each nuclide, only the dose conversion factor for the critical group should be used, thereby ensuring that the most vulnerable populations are protected. • There is no information provided as to how to address private wells. EPA should provide rules of thumb for how fast contamination would get into groundwater given certain depths to groundwater and soil type. This is a complicated issue and depends on many factors besides depth; however, a worst case scenario could be modeled for the major soil types.

<table>
<tr><td colspan="2">Chapter 2 – Early Phase:</td></tr>
<tr><td rowspan="2">QUESTION 3</td><td>The most substantive PAG change in the Early Phase is the 2001 guidance from the FDA that lowers the threshold for administration of potassium iodide (KI) to the public from 25 rem projected adult thyroid dose to 5 rem projected child thyroid dose. Chapter 2 includes a streamlined implementation scheme based on FDA's guidance. Please comment on the usefulness of this simplified guidance in the text of Chapter 2.</td></tr>
<tr><td>COMMENTS:

• A highly visible section should be added that specifies the potential hazards associated with taking KI (i.e., allergic reactions). This section should be located in close proximity to the guidance table, so that those persons making the decision to take KI are clearly aware of the hazards.

• A reduction from 25 Rem to 5 Rem for administration of KI to the public is appropriate.

• This is the most conservative protection approach. It uses the thyroid dose limit of the most sensitive age group of the population (child) as the PAG level to administer the KI to the general target population. It helps to avoid the possible thyroid risk of children from exposure. Thus, it is a good recommendation.

• Some States do NOT recommend KI to the public. Therefore, we agree with listing KI as a supplemental protective action.</td></tr>
<tr><td rowspan="2">QUESTION 4</td><td>The skin and thyroid evacuation thresholds were removed to avoid confusion with the KI threshold. The skin and thyroid doses were 5 and 50 times higher, respectively, than the 1 to 5 rem whole-body dose guideline. Please comment specifically on the appropriateness of not retaining the skin and thyroid evacuation thresholds.</td></tr>
<tr><td>COMMENTS:

• This was an appropriate step to avoid confusion, given the potential for misunderstandings when non-radiation professionals may be using the document for guidance.

• The removal of skin and thyroid evacuation threshold limits is appropriate and simplifies the decision-making process.

• Thyroid and skin are peculiar organs that need protection measures before they are seriously affected by the radiation. The thyroid may be affected seriously due to the releases of Iodine from the incident. Of</td></tr>
</table>

	course, this problem may be solved by administrating KI without evacuation if the release would not stay for a long time but the skin may be exposed continuously due to the deposition of beta and gamma emitters' radionuclide on the clothes and skin, particularly with low energy beta and gamma energy radionuclides. This means there might be a possibility that the skin that would absorb a radiation which is greater than the dose limit for the skin before the whole body dose reaches to the minimum of 1rem. How is it justified to waive the 1992 PAG for the skin and thyroid evacuation thresholds? This justification does not appear to be in the manual. • States may wish to continue to use a Thyroid PAG as they do not currently issue KI to the public. Therefore, we recommend including language in the document that States may continue to use a Thyroid PAG for evacuation or shelter if they wish to add this additional PAG to ensure the public health and safety is protected in all possible scenarios.
Chapter 3 – Intermediate Phase	
QUESTION 5	**The most substantive PAG change in the Intermediate Phase is the removal of the 5 rem over 50 years relocation PAG which was potentially being confused with long term cleanup. Please comment on the appropriateness of this change.**
	COMMENTS: • This change was appropriate for clarification purposes. 50 years could easily be mistaken to suggest a lifetime dose. • The 50 year relocation PAG was unrealistic given decay, weathering, changing population demographics and multiple other considerations. Its elimination is appropriate. • 5 rem over 50 years is very low compared to the current proposal, which is greater than 2mrem in the first year, 0.5 rem /year in the second and subsequent years. The previous PAG for relocation is more conservative than the current proposed one. The reason (justification) for changing the previous PAG for relocation is not clearly in the manual. It might be good to show the reason for this change in the manual. As it is stated in the question, the change is to avoid confusion with the long term cleanup guide but it might be clearer to show this change from radiation risk perspectives. • The new draft guide also recommends taking simple dose reduction techniques if the projected dose is

	below 2rem (20 mSv). It is not clear to what extent the dose reduction techniques would be implemented. It may be clear if the simple dose reduction techniques are implemented until attaining a regulatory site release criteria, which is 25mrem/year. 25mrem/year is the NRC site release criteria. The purpose of the dose reduction techniques is to remove radionuclide contaminants released due to the incident and this in turn reduces the radiation dose rate to the acceptable limit of the public. • Removal of the long term PAG of 5 Rem is appropriate. Consideration out to 50 years should be part of the late phase/clean up criteria, not part of an intermediate phase PAG.
QUESTION 6	**As an extension of the PAGs, new guidance on reentry to relocation areas is provided to inform plans and procedures to protect workers and members of the public as the Intermediate Phase progresses. Please comment on the format and utility of this material.**
	COMMENTS: • The re-entry matrix will be especially useful for non-radiation professionals who have limited expertise in radiological issues, and are tasked with making decisions for re-entry. • The explanations provided are very helpful in adding details on issues such as waste minimization (pave, seal, or remove roadways), and decisions to demolish or decontaminate buildings, balanced with the difficulty of disposing of large volumes of radioactive waste. • The concept of limited re-entry (stay time) for specific tasks to minimize dose provides very useful information to both decision makers and the affected public. • Guidance on re-entry to protect workers and the public as the Intermediate Phase progresses is appropriate as long as the guidance remains generic (strategic) as opposed to tactical and States are afforded the flexibility to modify re-entry instructions with regard to event specifics. • Additional guidance on re-entry is beneficial.

QUESTION 7	**Please comment on whether it would be useful to develop a new, combined Intermediate Phase PAG considering all exposure pathways to potentially simplify decision making.**
	COMMENTS: • Such a document or section of the PAG would be very useful. Expansion on the discussion of processes to make the best use of existing assets during the intermediate incident phase while minimizing dose to the public would be recommended. • A selection of likely scenarios illustrating potential contamination events, along with associated dose projections, and recommendations for working (stay time) scenarios with associated dose projections, could be provided as examples. • The "stay time" concept is key to in-depth discussions on how best to utilize compromised assets, such as water and critical infrastructure systems, while decontaminating and reactivating those assets. • It would be premature to recommend development and institution of a new, combined Intermediate Phase PAG to potentially simplify decision-making; rather, assessing and evaluating the feasibility should first be considered. • We agree with the keeping the relocation PAG separate from the food PAG because the required actions to implement are so different (moving people vs. embargoing food products).
Chapter 4 – Late Phase	
QUESTION 8	**A brief planning guidance on the cleanup process is included. Please comment on the usefulness of this information, as well as how it might best be implemented in State, tribal and local plans. It should be noted that the extent and scope of contamination as a result of a NPP, RDD or IND incident may be at a much larger scale than a site or facility decommissioning or remedial cleanup normally experienced under established regulatory frameworks. Lesser radiological incidents may be well addressed under existing emergency response and environmental cleanup programs.**
	COMMENTS: • The discussion is beyond what would be needed by most local (and some State) decision makers, but it is very useful information for those who need to know what is involved in the process. The factors affecting

ED_001057_00006709

	feasibility, and ways to minimize waste while controlling dose, are good for planners and for the development of technical working groups. • Crucial to local and State decision makers, however, is the guidance providing information that the decision makers and the public will need to process, such as potential effects on overall community health, communication of risks, separation from home, and other stress factors on the population. • The information lays a good framework for people who will be making important decisions on behalf of the affected population and choosing paths forward after an incident. • This is quite limited in scope and the applicability narrow. More detailed guidance on clean-up and radioactive waste disposal would be appropriate. • This material might be better suited for an appendix. By making the guidance more of a checklist format it may also be more useful.
QUESTION 9	**A suggested process and organization for approaching the late phase cleanup is provided from the 2008 RDD-IND Planning Guidance. Please comment on the merging of that guidance with the 2013 PAG Manual.**
	COMMENTS: • Very helpful. The inclusion of the IND and RDD material is crucial to making the document stand alone. • Putting this information into the document is extremely applicable, as the NPP, IND, and RDD responses and paths forward overlap significantly. The information is pertinent to the goals of the report. • IND and RDD planning remains in its infancy; new tactics and countermeasures are constantly being introduced. Merging the 2008 RDD-IND Planning Guidance document and evaluating users against those metrics, rather than citing available references like NCRP, CDC, DHS and other guidance, may be inappropriate. • The new EPA PAG Manual needs more definitive guidance for State planners on how to implement the cleanup process. It is imperative that there be some standards established ahead of time that States can reference.

QUESTION 10	**Basic planning guidance on approaching radioactive waste disposal is included. Please comment on this material and how it should be implemented in emergency response and recovery plans at all levels of government.**
	COMMENTS: • The information is very good for State and federal decision makers, but is more information than local leaders may need, unless they are in an area affected or potentially affected by a disposal site. • It is suggested that this information being in an appendix to the main document. • This is quite limited in scope and the applicability narrow. More detailed guidance on clean-up and radioactive waste disposal would be appropriate. • The planning guidance states that the waste issue is a State issue. There are numerous scenarios where that would not be the case (e.g., terrorist attack). A large release could lead to low level waste volumes that are impossible to store realistically. Standards need to be developed that ensure that the amount of low level waste generated can be accommodated at existing low level waste storage facilities. States are looking for realistic solutions.

ADDITIONAL COMMENTS	• Strongly suggest adding an appendix devoted entirely to the needs of public information officers. • In the event of an IND or RDD, public understanding of why the decision makers are making specific, sometimes difficult, decisions will be imperative to acceptance of the measures decided upon. • Suggest including the links (below) in the appendix to the recently released FEMA guidance documents for pubic communication after an IND or NPP event: IND: https://s3-us-gov-west-1.amazonaws.com/dam-production/uploads/20130726-1919-25045-0618/communicating_in_the_immediate_aftermath__final_june_2013_508_ok.pdf NPP: https://s3-us-gov-west-1.amazonaws.com/dam-production/uploads/20130726-1919-25045-1433/communicating_during_and_after__npp_incident__june_2013__secure_.pdf • Section 2.7, CONTAMINATION LIMITS AND MONITORING OF THE ENVIRONMENT AND POPULATIONS, should include a reference to an appropriate resource for more detailed information and guidance, especially regarding community reception centers, monitoring, decontamination and medical evaluation. • Overall, an excellent document.

IEMA
Illinois Emergency Management Agency

Jonathon E. Monken, Director
Joseph Klinger, Assistant Director

September 13, 2013

Air and Radiation Docket and Information Center
Environmental protection Agency
Mail Code 6102 T
1200 Pennsylvania Ave NW
Washington DC 20460

Subject: Docket ID No EPA-EPA-HQ-OAR-2007-0268

To Whom It May Concern:

IEMA believes the efforts of the EPA to revise the current PAG Manual are a positive step. To the extent possible, IEMA has attempted to provide comments on the specific issues that were requested in Section E of the Federal Register Notice. However, we have some generic comments that apply to the entire document that we feel should be addressed before this new manual is considered final.

The title of the PAG Manual is "Protective Action Guides and Planning Guidance for Radiological Incidents". The first three chapters are clearly focused on the basis for the PAGS, the numerical values for projected dose comparison, and the actions that should occur. The fourth chapter focuses more on planning guidance and does not include much in the way of PAGs. Therefore, we feel that the title of the fourth chapter should be changed to "Planning Guidance for the Late Phase" instead of "Guidance for the Late Phase".

IEMA feels that referencing the 1992 version of the PAG manual is detrimental to the purpose of the new manual and could lead to much confusion. When the new version of the manual becomes final, it should completely replace the old version. IEMA feels that the sections of the old PAG manual that are still applicable should be contained in the new PAG manual. The 1992 version of the PAG manual was a standalone document that new users could use to completely understand the PAGs. Inclusion of that material in the new version would enhance the usability of the document.

Thank you for considering these comments and requests. The IEMA stands ready to assist our Federal partners and are available to provide additional details on any of these issues should you desire. I look forward to your response.

Sincerely,

Joseph Klinger

Joseph Klinger
Assistant Director

SPECIFIC COMMENTS ON PROPOSED EPA Manual of Protective Action Guides

1. **To implement the PAGs, the reader is referred to dose calculations in the Federal Radiological Monitoring and Assessment Center (FRMAC) Assessment Manuals. The Assessment Manuals are updated with current International Commission on Radiological Protection (ICRP) dosimetry models (i.e., ICRP 60 series) and dose coefficients. The FRPCC also encourages the use of computational tools such as DOE's Turbo FRMAC, RESRAD RDD and NRC's RASCAL or other appropriate tools and methods to implement the PAGs. We request comment on the usefulness of this approach and seek feedback on how to facilitate implementation of these methods in emergency management plans.**

   IEMA understands why EPA has chosen to recommend the use of computational tools such as Turbo FRMAC and RASCAL to calculate values to be compared to the PAGs. While in basic agreement with this concept, it should be made clear that there may be a slight difference in results depending on which model is used.

2. **The Agency recognizes a short-term emergency drinking water guide may be useful for public health protection in light of the Fukushima nuclear power plant accident, which impacted some Japanese drinking water supplies. Input on the appropriateness of, and possible values for, a drinking water PAG is being sought.**

   This version of the PAG manual references values as low as 4 mrem/year (NPDWR and SWDA) and as high as 10 rem/year (IAEA). IEMA believes that 4 mrem/year is not appropriate because it is intended for non-emergency situations and does not reflect the intent of the DHS RDD/IND PAGs. IEMA believes that the IAEA value is also not appropriate because it is too high. IEMA believes that water should be treated like any other food type. If one child is drinking milk and another child is drinking water, then the limiting concentrations should be identical. IEMA recommends that the drinking water PAG should be 500 mrem effective or 5000 mrem organ.

3. **The most substantive PAG change in the Early Phase is the 2001 guidance from the FDA that lowers the threshold for administration of potassium iodide (KI) to the public from 25 rem projected adult thyroid dose to 5 rem projected child thyroid dose. Chapter 2 includes a streamlined implementation scheme based on FDA's guidance. Please comment on the usefulness of this simplified guidance in the text of Chapter 2.**

   Much of this section discusses the various effects of radioiodine on the different age groups. Although we are not disputing this fact, the way it is presented appears contradictory and confusing. It would be much simpler to state that the effects of radioiodine will vary among the different populations, but for practical reasons, it is recommended that KI be administered at the lowest intervention threshold (> 5 rem projected thyroid internal exposure in children). Additionally, some states do NOT recommend KI to the public. Therefore, IEMA agrees with listing it as a supplemental action.

4. **The skin and thyroid evacuation thresholds were removed to avoid confusion with the KI threshold. The skin and thyroid doses were 5 and 50 times higher, respectively, than the 1 to 5 rem whole-body dose guideline. Please comment specifically on the appropriateness of not retaining the skin and thyroid evacuation thresholds.**

   IEMA feels that the removal of the thyroid evacuation threshold is inappropriate because it is contradictory. For example, if you run RASCAL using a containment reading, leak rate, and direct (unfiltered) release from the reactor building, the thyroid dose could be the controlling dose. The projected thyroid dose could be in excess of the PAG to recommend KI, but the TEDE dose would not be in excess of the evacuation PAG. Additionally, in many states, evacuation is the preferred protective action over issuance of KI. Therefore, IEMA recommends leaving the language to use a thyroid PAG threshold for evacuation or shelter.

5. **The most substantive PAG change in the Intermediate Phase is the removal of the 5 rem over 50 years relocation PAG which was potentially being confused with long term cleanup. Please comment on the appropriateness of this change.**

   IEMA feels that the removal of the long term PAG of 5 Rem is appropriate. Consideration out to 50 years should be part of the late phase/clean up criteria, not part of an intermediate phase PAG.

6. **As an extension of the PAGs, new guidance on reentry to relocation areas is provided to inform plans and procedures to protect workers and members of the public as the Intermediate Phase progresses. Please comment on the format and utility of this material**.

   IEMA feels that additional guidance on reentry is beneficial. However, the current format and content could be enhanced. Currently, IEMA has procedures that provide additional guidance on reentry. Not only does this guidance include a total that the individual should not exceed, but it also provides guidelines on exposure rates, plant conditions, and environmental conditions that should be considered before authorizing permission for reentry.

7. **Please comment on whether it would be useful to develop a new, combined Intermediate Phase PAG considering all exposure pathways to potentially simplify decision making**.

   IEMA agrees with keeping the relocation PAG separate from the food PAG because the required actions to implement are so different (moving people vs. embargoing food products).

8. **A brief planning guidance on the cleanup process is included. Please comment on the usefulness of this information, as well as how it might best be implemented in state, tribal and local plans**

   Although IEMA applauds the USEPA for creating a structure that incorporates all the stakeholders involved, we find Chapter 4 – Guidance for Late Phase to be a very simplistic overview of the cleanup/decommissioning process and is lacking in both guidance and technical merit. Thus, this creates concerns about its use and effectiveness as a decision making aid. As stated in Section 1.1, "this Manual provides recommended numerical protective action guides (PAGs) for the principal protective actions available to public officials during a radiological incident", the purpose of the PAG is to provide stakeholders with a decision making tool to aid them in protecting the public and environment from unwarranted doses of radiation during and after an event. Since cleanup activities would take years to complete and the fact that a PAG level is not to be used in the long term, IEMA suggest that the cleanup guidance put forth in this document be removed and a standalone cleanup/decommissioning guidance document be created much like *NUREG 1757 Consolidated Decommissioning Guidance*. The new guidance would then be the platform for stakeholders to make informed decisions. This would also mean that the Late Phase would primarily consist of characterization of the resultant contamination. That data would then be used for a risk-informed regulatory approach to the cleanup.

9. **A suggested process and organization for approaching the late phase cleanup is provided from the 2008 RDD-IND Planning Guidance. Please comment on the merging of that guidance with the 2013 PAG Manual**.

   IEMA agrees that merging the 2008 RDD-IND Planning Guidance with the 2013 PAG Manual is appropriate.

10. **Basic planning guidance on approaching radioactive waste disposal is included. Please comment on this material and how it should be implemented in emergency response and recovery plans at all levels of government.**

As discussed in the PAG Manual, the volume of waste resulting from an incident at a nuclear power plant or an RDD/IND event could overwhelm the existing LLRW disposal capacity and there are limitations to using DOE facilities for the disposal of non-DOE waste. The USEPA assumes that RCRA Subtitle D and C landfills could be a viable disposal option for waste generated from a like event but again, there are hurdles that need to be cleared before landfills are able to accept this waste form. Because of all the existing problems with disposal of waste that would be generated from a large scale radiological event, IEMA asks that the USEPA and the federal government work with the states and be proactive rather than reactive in solving these issues. Part of those discussions would be to determine who is responsible for paying for waste disposal. The USEPA states in the manual that the financial burden lies with the state in which the event occurs. If the event is NPP accident, a revenue stream is in place but if the event is a RDD/IND then this becomes a national security issue, which would be a federal government responsibility.

Sunday, September 15, 2013

Subject: Withdraw Proposed Protective Action Guidelines because they fail to protect the public health -- Protective Action Guides Manual; Updates: Protective Action Guides and Planning Guidance for Radiological Incidents (Document ID EPA-HQ-OAR-2007-0268-0001)

Dear EPA Administrator McCarthy,

I am writing to you today to express my strong opposition to the proposed Protective Action Guidelines (PAGs) for radiation releases because they fail to protect the public health. I demand that the Environmental Protection Agency (EPA) withdraw the PAGs it released on April 15, 2013 for the following reasons:

- The EPA relies on advice from nuclear industry funded organizations, like the National Council on Radiation Protection and Measurements (NCRP), to help establish radiation exposure levels for the public. This is an obvious conflict of interest.

- The EPA PAGs fail to incorporate the lessons of nuclear catastrophes, like Chernobyl and Fukushima (which is now dumping hundreds of tons of radioactive water a day into the Pacific), by ignoring increasing and migrating contamination.

- The EPA fails to incorporate key applicable recommendations of the United Nations Human Right to Health report, recently released, on the Fukushima disaster.

- The PAGs fail to protect the public by using blanket guidelines for all radioactive releases.

- The PAGs fail to require the EPA to work with other agencies to ensure the public is fully informed of, and protected from, man-made radiation in food.

- The EPA fails to fully account for any longer term chronic exposure sources like contaminated food.

- The PAGs fail to protect the public by raising the radiation standards for drinking water to well above Safe Drinking Water Act limits.

- The PAGs fail to protect the public by establishing poor long-term cleanup standards.

- The PAGs fail to protect the public by establishing new allowances to permit disposal of radioactive waste in unlicensed sites.

- Allowing 1 in 6 people to get cancer from radiation exposure in order to protect nuclear industry profits works against the EPA's mission to "protect human health and the environment." The EPA needs to make health the driver of cleanup and recovery, not industry economics.

> *"It is horrifying that we have to fight our own government to save the environment."*
> *-- Ansel Adams*

I ask that you do the following:

- Do not set a precedent for unsafe disposal of nuclear waste in these guidelines, by allowing disposal in unlicensed sites.

- Maintain or strengthen the drinking water standards rather than roll them back.

- Keep, or make more protective, the action levels for doses to the thyroid and the skin that are already in place.

- Remove the automatic acceptance of very high food and water contamination levels (higher than being used in Japan after Fukushima).

> *"Do not suffer your good nature, when application is made, to say 'Yes' when you should say 'No'. Remember, it is a public not a private cause that is to be injured or benefited by your choice."*
> *-- George Washington*

In the wake of the Fukushima accident, the US government should be doing more to protect public health and safety, not less. I demand the PAGs be withdrawn, rather than adjusted or amended, because of the EPA's connection to the NCRP, an industry-funded entity sponsored and supported by the EPA to advise them on these guides. This collaboration with NCRP is a conflict that will make creating independent, protective radiation standards extremely difficult. Please do not let the interest of a quick cleanup supersede your responsibility to protect public health and safety.

> *"A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise."*
> *-- Aldo Leopold*

Thank you for your consideration of my comments. Please do NOT add my name to your mailing list. I will learn about future developments on this issue from other sources.

Sincerely,
Christopher Lish
Olema, CA

MessageID: <3E02263887F34348AF74BA9432AE4F186CD476BE@UM-MBX-N01.um.umsystem.edu>
From: "Eerkens, Jozef W." <EerkensJ@missouri.edu>
Sent: 07/10/2013 06:18:30 PM
Subject: Docket ID No. EPA-HQ-OAR-2007-0268

Body: 7/10/13

I strongly applaud EPA's action to return to science-based radiation safety regulations. In a modern society we cannot have rules based on phantasies and unfounded fears that many anti-nuclear techno-phobes try to iinfuse into the public. As a nuclear engineering professional for 50 years who has carefully followed all nuclear-related issues, I am satisfied that nuclear power can be and is generated extremely safely in the USA and (now) also globally.

Safe clean nuclear power is a gift of providence and essential to allow mankind to overcome the crisis it faces by mid-century when oil and gas fields will become depleted. Our children and grand-children will need a lot of it. Nuclear fission energy can provide (for 5000 years) all "big mama" source energy required for making synfuels and electricity that keeps modern society going. As a bonus it will also ameliorate global warming and air pollution since it does not dump anything into the atmosphere. Fickle wind and solar energy could never replace gas, oil, and coal (gone in 100 years) and compete with nuclear. It is too unreliable and dispersd. Even if we covered all of our scenic deserts and mountains with windmills and solar panels, it could never contribute more than 10% of all energy man needs, which includes manufacturing cars, ships, aircraft, bridges, etc, etc., energy consumptions that are often overlooked.

Some hysterical uninformed anti-nuclear groups (however well-meaning) want to ban all nuclear power and demand that safe radiation levels be set below what everyone of us is already exposed to by nature (K-40, cosmic rdiation, etc). The human body has evolved succesfully under this radiation level and might even have benefitted (hormesis) from it. Such anti-nuclear groups are unaware that their actions, if carried out, would ultimately cause the collapse of our modern world, the same goal of Al Qaida and other nihilist terrorrists.

Please stand firm against attacks by anti-nuclear groups who want you to maintain or increase unrealistic MPD (= maximum permissable dose) radiation levels that are scientifically senseless. They will only unnecessarily increase the cost of providing more badly needed nuclear energy to the world.

Jeff W. Eerkens, PhD-NE, UC-Berkeley, 1960

MessageID:
<14504_1373494995_51DDDED2_14504_6719_1_9B44A9B612B803468CFAC905E1161E381F487A0E@USCLTEXMB01.epri.com>
From: "Rogers, Lee" <lrogers@epri.com>
Sent: 07/10/2013 06:22:41 PM
Subject: Docket ID No. EPA-HQ-OAR-2007-0268

Body: Every U.S. nuclear power plant has a detailed plan for responding in the event of an emergency to protect public health and safety. Plant personnel test the plans regularly with the participation of local and state emergency response organizations.
EPA's guidance represents an extensive and well-researched effort. The agency has arrived at a sound approach to achieve a necessary recovery from extremely unlikely emergency events.
Importantly, the EPA's proposed guidance does not seek to change existing standards on radiations levels that are considered safe—either with cleanup standards or allowable exposure. Radiation exposure targets in the guidance are limits at completion of cleanup activities.
The draft guidance incorporates lessons learned from Fukushima, updates the scientific bases for decision-making, and affords emergency personnel, policymakers and the public flexibility to balance radiation health risks with other factors to ensure that protective actions "result in more benefit than harm," according to the guidance notice. Another positive aspect is that it provides guidance for radiological events regardless of the cause.

LAR Electronic Signature 3

Lee Rogers

Senior Project Manager

Nuclear Plant Technology

772-288-4369

lrogers@epri.com

Together...Shaping the Future of Electricity

STATE OF WASHINGTON
DEPARTMENT OF HEALTH
OFFICE OF RADIATION PROTECTION
111 Israel Road SE • PO Box 47827 • Olympia, Washington 98504-7827
TDD Relay Services: 1-800-833-6388

September 10, 2013

Air and Radiation Docket Information Center
Environmental Protection Agency
ATTN: Docket ID No. EPA-HQ-OAR2008-0268
Mail Code: 6102T
1200 Pennsylvania Avenue NW
Washington, DC 20460

Re: Request for Comments on Interim Guidance

The Washington State Department of Health, Office of Radiation Protection, appreciates the opportunity to review and comment on the updates to the Interim Use Protective Action Guides Manual: Protective Action Guides (PAGs) and Planning Guidance for Radiological Incidents, 78 Federal Register 22257, April 15, 2013.

Our Radiological Emergency Preparedness Section provided the initial review of this document. Their comments were submitted for review and evaluation to our Environmental Sciences Section and our Office of Drinking Water. The final comments are enclosed.

If you have questions, please contact Mark Henry at mark.henry@doh.wa.gov or (360) 236-3271.

Sincerely,

David B. Jansen, P.E., LEED AP
Director

Enclosure

COMMENTS
from the Washington State Department of Health
on the Environmental Protection Agency Interim Guidance
Docket ID No EPA-HQ-OAR2008-0268

1. **To implement the PAGs, the reader is referred to dose calculations in the Federal Radiological Monitoring and Assessment Center (FRMAC) Assessment Manuals. The Assessment Manuals are updated with current International Commission on Radiological Protection (ICRP) dosimetry models (i.e., ICRP 60 series) and dose coefficients. The FRPCC also encourages the use of computational tools such as DOE's Turbo FRMAC, RESRAD RDD and NRC's RASCAL or other appropriate tools and methods to implement the PAGs. We request comment on the usefulness of this approach and seek feedback on how to facilitate implementation of these methods in emergency management plans.**

   We understand that all of these modeling programs are effective in performing needed calculations. Each program will produce somewhat different results based on the assumptions used in developing the programs. Each program has different strengths based upon its intended purpose and the differing needs of the user and type of event. The results provided by each of these programs will be useful even with the differences given the number of uncertainties in a radiological event.

   For example, during a commercial nuclear power plant event, NRC's RASCAL would be most useful during the very initial stages of the event. It should at that time be checked against Turbo FRMAC. At some point in the event, enough information will be received from outside of the plant environment that Turbo FRMAC would then become the primary tool with NRC's RASCAL being the check program. In the instance of an RDD, correlating runs should be performed using Turbo FRMAC for immediate protective actions while RESRAD RDD information would be used to look at intermediate and late phase protective actions. These two data sets can be compared for cross-checking accuracy and refining protective actions.

   In regard to basing the dosimetry models and coefficients of the ICRP recommendation, the ICRP provides the best science and statistics available and should be incorporated to bring local, state and federal programs in line with programs internationally. As evidenced during Fukushima, the releases from the Daiichi reactors were of international concern and caused actions to occur around the world to assure that effects to the public health were mitigated. In addition, events where international support is needed such as major nuclear power plant releases and improvised nuclear device detonation, basing guidance on international guidance brings each nation closer to planning and training to the same standards which can provide a marked increase in the efficiency of response support.

2. **The Agency recognizes a short-term emergency drinking water guide may be useful for public health protection in light of the Fukushima nuclear power plant accident, which impacted some Japanese drinking water supplies. Input on the appropriateness of, and possible values for, a drinking water PAG is being sought.**

   <u>Page 9, Chapter 1, Section 1.4.3</u>
   The 5th paragraph on this page states that EPA is not proposing a specific, drinking water Derived Intervention Level (DIL) at this time. The manual refers to the existing standards under the Safe Drinking Water Act. The Safe Drinking Water Act limits are inappropriate for a one-

time accidental contamination involving radioactive materials, such as from a release at a nuclear power plant. The Safe Drinking Water Act limits are intended for use where the reference individual will be consuming the same water source at the same contaminant level for a period of 70 years. The EPA, in conjunction with the FDA, needs to publish useful emergency DILs for drinking water that are consistent with the FDA's guidance for food and milk. Our suggested values for the primary radionuclides would be found in Table 8.4 of NCRP 138. The NCRP 138 values are based on recommendations from the IAEA and the WHO. As an example of the incorrect applicability of the current SDWA limits, the State of Washington would have had to implement protective actions for I-131 in drinking water, when no health risk existed, following the Fukushima accident due to rain catchment systems exceeding the 3 pCi/L (0.0001 kBq/L) SDWA limit by at least 50 times. Suggested values are below in kBq/L (pCi/L).

Drinking water	kBq/L (pCi/L)
Cs-134, Cs-137, Ru-103, Ru-106, Sr-89	1 (27,000)
I-131, Sr-90	0.1 (2700)
Am-241, Pu-238, Pu-239, Pu-240, Pu-242	0.001 (27)

3. **The most substantive PAG change in the Early Phase is the 2001 guidance from the FDA that lowers the threshold for administration of potassium iodide (KI) to the public from 25 rem projected adult thyroid dose to 5 rem projected child thyroid dose. Chapter 2 includes a streamlined implementation scheme based on FDA's guidance. Please comment on the usefulness of this simplified guidance in the text of Chapter 2.**

   Pages 19-20, Chapter 2, Section 2.3.4
   We agree with recommending the administration of KI at a projected dose of 5 rem to the Thyroid. We currently recommend administration of KI at 5 rem Thyroid dose for our Emergency Workers.

4. **The skin and thyroid evacuation thresholds were removed to avoid confusion with the KI threshold. The skin and thyroid doses were 5 and 50 times higher, respectively, than the 1 to 5 rem whole-body dose guideline. Please comment specifically on the appropriateness of not retaining the skin and thyroid evacuation thresholds.**

   We agree with the decision to NOT retain the skin and thyroid evacuation thresholds.

5. **The most substantive PAG change in the Intermediate Phase is the removal of the 5 rem over 50 years relocation PAG which was potentially being confused with long term cleanup. Please comment on the appropriateness of this change.**

   We agree with the removal of the 5 rem over 50 years relocation PAG.

COMMENTS
from the Washington State Department of Health
on the Environmental Protection Agency Interim Guidance
Docket ID No EPA-HQ-OAR2008-0268

6. **As an extension of the PAGs, new guidance on reentry to relocation areas is provided to form plans and procedures to protect workers and members of the public as the Intermediate Phase progresses. Please comment on the format and utility of this material.**

   We support the use of the 2009 DOE guidance as a basis to expand plans and procedures for guiding re-entry into relocation areas. In fact, it is part of our State Radiological Response Plan for RDDs which is applicable to all radiological events. This plan is written as more of a guidance document for local plan development. There is a section we included that functions as an Emergency Operations Plan and provides contamination limits from the 2009 DOE guidance for re-entry activities. Specific details of re-entry activities should be detailed in local emergency management plans with oversight and support from state radiological subject matter experts.

7. **Please comment on whether it would be useful to develop a new, combined Intermediate Phase PAG considering all exposure pathways to potentially simplify decision making.**

   We believe that the relocation PAG should be kept separate from the food PAGs.

8. **A brief planning guidance on the cleanup process is included. Please comment on the usefulness of this information, as well as how it might best be implemented in state, tribal and local plans. It should be noted that the extent and scope of contamination as a result of an NPP, RDD or IND incident may be at a much larger scale than a site or facility decommissioning or remedial cleanup normally experienced under established regulatory frameworks. Lesser radiological incidents may be well addressed under existing emergency response and environmental cleanup programs.**

   The information is useful and should be included in the guidance. Implementation processes will be determined by the state, local, tribal, and NGO structure and process for each state. To facilitate each state's planning effort, a coordination workshop could be held annually at a venue such as the National Radiological Emergency Preparedness conference to share key areas of concern.

9. **A suggested process and organization for approaching the late phase cleanup is provided from the 2008 RDD-IND Planning Guidance. Please comment on the merging of that guidance with the 2013 PAG Manual.**

   We believe that it is more effective and efficient to align response planning and training for all types of radiological emergencies as much as possible.

10. Basic planning guidance on approaching radioactive waste disposal is included. Please comment on this material and how it should be implemented in emergency response and recovery plans at all levels of government.

We do not see the waste generated from an Act of Terrorism as solely a State issue. An Act of Terrorism against the United States is a federal government issue and should be handled as such in coordination with state and local jurisdictions. To place this responsibility entirely on a state would bring about economic conditions that could possibly bankrupt state and local jurisdictions. In addition, radiological emergencies originating in nuclear power plants, department of defense facilities, and federal reservations are regulated by the federal government. Therefore, waste generated from releases of radioactive material from these events should be shouldered primarily by the responsible parties (i.e. owner/federal government) in coordination with state and local jurisdictions.

ADDITIONAL COMMENTS

1. Page 5, chapter 1, section 1.4

The 2nd bullet (Intermediate Phase) states, "The period beginning after the source and releases have been brought under control (has not necessarily stopped but is no longer growing)..." is contradictory to the 1992 document where it states, "The intermediate phase is the period beginning after the source and releases have been brought under control and reliable environmental measurements are available for use as a basis for decisions on additional protective actions." It is also in conflict with the statement made in Section 3.1 of this manual which is consistent with the 1992 manual's statement. The parenthetical should be removed to provide accuracy and consistency. The Intermediate Phase cannot begin before the release terminates as it is impossible to characterize what has been deposited on the ground while material is still being released.

2. Page 9, Chapter 1, Section1.4.3

The 3rd paragraph contains a NOTE which includes, "In some instances, however, where withdrawal of food and/or water from use would, in itself, create a health risk, relocation may be an appropriate alternative protective action. In this case, the ingestion dose should be considered along with the projected dose from deposited radionuclides via other pathways, for decisions on relocation." It is difficult to imagine a situation in the United States where a clean source for food and water would not be available, particularly in populated areas near nuclear power plants. This is not the Ukraine or Belarus where the people only have the crops they grow to provide them with food.

COMMENTS
from the Washington State Department of Health
on the Environmental Protection Agency Interim Guidance
Docket ID No EPA-HQ-OAR2008-0268

3. **Page 9, Chapter 1, Section 1.4.3**

   The first sentence in the 4th paragraph should be changed to read, "Keeping projected doses below the 0.5 Rem/yr (5 mSv/yr) PAG out for years - ...". These exposure values should indicate the applicable time frame.

4. **Page 15, Chapter 2, Section 2.3, Table 2-1**

   Footnote 'd' of the table states "Thyroid equivalent dose (see Section 2.3.5)"
   Section 2.3.5 is PAGs and Nuclear Facilities Emergency Planning Zones (EPZs) and has nothing to do with thyroid dose. This is probably a remnant from a previous revision. Section 2.3.4 is Considerations for Potassium Iodide (KI) and is probably where footnote 'd' should reference. We can find no mention of the words "Thyroid equivalent dose" in Section 2.3.4. The footnote should be revised to remove the word "equivalent" to conform to section 2.3.4.

5. **Page 21, Chapter 2, footnote10**

   We appreciate the comparison of the Naval Nuclear Propulsion Program (NNPP) reactors to commercial Nuclear Power Plants (NPP). There are three NNPP facilities in our state and we are frequently asked why the NNPP emergency planning zones are so small compared to a commercial NPP.

6. **Pages 26, 27, and 28, Chapter 2.6.2, Tables 2-2 and 2-3**

   Every effort should be made to avoid breaking tables over two pages. Splitting the table between the bottom of one page and the top of the subsequent page disrupts the ease of understanding of the tables. Tables and associated footnotes need to be kept as one.

7. **Page 36, Chapter 3.3, Table 3-1**

   Footnote "a" of the table references (see Section 3.7). Is this the correct reference?

8. **Page 41, Chapter 3, Section 3.4.2**

   The last paragraph of this section prompts the same comment as for Page 9, Chapter 1, Section1.4.3 regarding the withdrawal of food and drinking water.

9. **Page 42, Chapter 3, Section 3.5**

   The 2nd paragraph reiterates the statement about not proposing a specific drinking water PAG. We make the same comment here as was made for Page 9, Chapter 1, Section 1.4.3 requesting the establishment of an appropriate PAG for accidental contamination of drinking water.

September 16, 2013

The Honorable Gina McCarthy
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Re: Protective Action Guides for Radionuclides (Docket ID No. EPA–HQ–OAR–2007–0268)

Dear Administrator McCarthy:

We write to express our concern about and opposition to key aspects of the revised Protective Action Guides (PAGs) for responding to releases of radioactivity. PAGs identify radiation doses that are to trigger actions to protect the public so as to avoid public exposures in excess of those doses. As such, the PAGs are critical for public protection; weak PAGs can significantly endanger the public.

On 15 April 2013 the Agency published in the *Federal Register* a request for public comment on the proposed PAG revisions; 78 FR 22257-60. Simultaneously, however, EPA made the new PAGs immediately effective, raising questions about whether the public comment opportunity is *pro forma* or serious.

Nonetheless, we respectfully submit this delineation of significant problems in the PAGs. Many of our organizations opposed efforts by EPA in the last days of the George W. Bush Administration to issue PAGs that would have substantially weakened radiation protections for the public by, for example, increasing dramatically the amount of radioactivity permitted in drinking water and in soil. We were gratified when the Obama Administration in its first days in office withdrew the Bush-era PAG proposal and promised a thorough review.

The current Obama PAGs now issued are in many respects as troubling as the Bush proposal, and in some particulars, even weaker in terms of public health protection. Some cosmetic changes have been made—e.g. vaguer language is used which may have the same disturbing effect. But at their core, rather than specifying protective actions to prevent public exposures, the PAGs would allow massive radiation exposures without any protective actions being recommended to limit them. We recommend the PAGs be withdrawn.

Our primary concerns are: (1) the proposal to allow, for one to several years after a release, radioactive contamination of drinking water at levels orders of magnitude above EPA's longstanding Safe Drinking Water Act (SDWA) limits, (2) language contemplating long-term cleanup standards vastly less protective than EPA's historically acceptable risk range, (3) the elimination of relocation PAGs for high thyroid and skin doses and for high projected cumulative whole body doses, (4) the recommendation to permit radioactive waste to be disposed of in unlicensed disposal sites, including regular municipal garbage dumps, (5) the inappropriate expansion of the PAGs to cover essentially all radioactive releases, from the most extraordinary (e.g. nuclear weapons explosions) to those far less consequential (e.g. transportation accidents involving relatively small amounts of radioactivity), (6) relying on PAG dose limits as high or higher than those in effect decades ago despite the fact that official estimates of cancer risks from radiation have increased significantly over that period, and (7) apparently un-reviewed retention of archaic and extremely high FDA food contamination guidelines.

Background

During the George W. Bush Administration, the Department of Homeland Security (DHS) issued PAGs for responding to the use by a terrorist group of an Improvised Nuclear Device (IND) or a "dirty bomb," a Radiological Dispersal Device (RDD). The DHS PAGs were very controversial. Many of us joined in critical comments.[1]

The DHS PAGs recommended not setting any standard for long-term cleanup but rather adopted a vague process called "optimization" in which the economic interest in not spending money on cleanup could outweigh the public health need to do so. No health-based standard would be established in advance in the PAGs, so decisions about how much to clean up would be made after the fact, selecting from various contradictory "benchmarks" from national or international advisory committees. Those entities are often heavily dominated by nuclear interests and have pressed for not requiring cleanup until doses reach extraordinary levels.

One of the benchmarks considered was *to not undertake cleanup* if the dose to the public were less than 1 rem (1000 mrem) per year (the equivalent of approximately 15,000 chest X-rays over thirty years) and *to only require cleanup over 10 rem per year* (roughly 150,000 chest X-rays over the same period), with discretion to not undertake cleanup when exposures are between those two doses.[2] According to the EPA's own current risk estimates per unit dose in its most recent "Blue Book,"[3] derived from the National Academy of Sciences' Report on the Biological

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[1] See, e.g., group comment letter of 14 April 2006 and letters to then -EPA Administrator Leavitt of 2 December 2004 and 27 January 2005, attachments found , beginning at pg. 155, at http://committeetobridgethegap.org/wp-content/uploads/2013/04/080509LetterToEPAbr5.pdf and incorporated herein by reference.

[2] The adult dose from a PA (posterior-anterior or front) view chest X-ray is typically 2 millirem.

[3] *EPA Radiogenic Cancer Risk Models and Projections for the U.S. Population,* EPA 402-R-11-001, April 2011. The Blue Book sets the excess cancer risk at an age - and sex-averaged value of 1.16×10^{-1} per Gray, with the first 30 years of life the risk being approximately 1.8 times higher. EPA standard practice when one doesn't consider lifetime exposure is to presume exposure over the first 30 years of life for residential scenarios and over the first 40 years for farmer scenarios.

Effects of Ionizing Radiation (BEIR VII), 1 rem per year over the first thirty years of life would result is an excess cancer in every 17th person exposed.[4] At 10 rem/year, EPA's own estimate is that one in every 1.7 people exposed would get a cancer from the radiation.[5] Allowing such high numbers of cancers to be produced from exposure to contamination would obviously be orders of magnitude beyond risks EPA has ever considered acceptable.

The DHS PAGs also recommended allowing radioactive contamination of drinking water at levels far higher than the SDWA allows.[6] Despite the substantial public opposition, the Bush Administration adopted the DHS PAGs.

Subsequent to the issuance of the DHS PAGs, EPA attempted to extend these weakened standards from terrorist events to non-terrorist events and indeed, to all radiological releases. In the EPA proposed PAGs, "optimization" was included for long-term cleanup and actual radionuclide concentrations were put forward for drinking water. Those drinking water levels were orders of magnitude higher than EPA's Safe Drinking Water Act. For some radionuclides, EPA was proposing to allow people to drink water contaminated to such a high level that drinking a single small glass would exceed a lifetime permitted consumption under the SDWA, according to internal EPA analyses obtained under the Freedom of Information Act.[7] Independent analyses confirmed this, showing that the proposed drinking water levels were, depending on the radionuclide, hundreds, thousands, tens of thousands, and hundreds of thousands of times higher than the SDWA limits.[8]

The EPA PAGs that the outgoing Bush Administration tried to publish in its last days in office also would have adopted the deeply troubling DHS "optimization" process for long-term cleanup. Furthermore, the applicability of the PAGs would have been extended to *all* radioactive releases.

Recognizing the highly problematic aspects of these proposals by the outgoing Administration, the Obama Administration withdrew them and promised a full and careful review. We were thus hopeful that when new PAGs were released, they would be truly protective. We have been deeply disappointed.

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[4] 1 rem/year x 30 years x 2 x 1 0-3 cancers per rem during the first 30 years = 6 x 10 -2 cancers = 1 cancer per 17 people exposed.

[5] These are gender-averaged risk figures. Females are at even greater risk than males from the same levels of exposure meaning their risks are even higher than these estimates.

[6] The DHS PAGs recommended a high dose level for radiation from drinking water but did not provide specific concentrations for individual radionuclides .

[7] http://www.peer.org/news/news -releases/2010/04/05/radiation -exposure-debate-rages-inside-epa/

[8] See Hirsch and Marx, *Proposed Relaxation of EPA Drinking Water Standards for Radioactivity,* Committee to Bridge the Gap, October 2008, found as an attachment to the URL identified in footnote 1 above and incorporated herein by reference.

1. <u>The PAGs Propose Allowing Radioactive Contamination of Drinking Water That Would Be Orders of Magnitude Higher than EPA's Longstanding Safe Drinking Water Act Limits</u>

The Bush Administration PAGs presented a table of concentrations for specific radionuclides that it proposed would be allowed without requiring treatment or alternative water sources. These concentrations were grossly higher than the levels permitted under the SDWA. The furor they provoked contributed to the Obama Administration withdrawing the proposal.

However, rather than rejecting the Bush Administration approach, the new PAGs issued by EPA adopt a similar tack—proposing abandoning the SDWA requirements and replacing them with considerably higher values. But unlike the Bush PAGs, which expressly included a table of the extreme concentrations proposed for each radionuclide, the new PAGs bury the proposed alternatives in footnotes. (Footnotes 24-27 on p. 42). The actual values for the alternatives are not even included, only citations to other works. No comparison is provided whatsoever as to how much each of these proposed alternatives would weaken the protections in the SDWA.

We have thus undertaken that missing analysis. The results are striking and are summarized in the tables below. The first shows, for four key radionuclides, the EPA Safe Drinking Water Act limits (in becquerels per liter, bq/L) compared with the alternatives now proposed by EPA in the new PAGS, as well the values previously proposed by the Bush Administration. One sees the extraordinary weakening of protections EPA now proposes.

Obama Drinking Water PAG proposals vs. Existing EPA Safe Drinking Water Levels and Bush Administration PAG Proposal
units = Bq/L

Radionuclide	EPA Safe Drinking Water Act Maximum Contaminant Limit (MCL)	**Bush Proposed Drinking Water PAG**	**Obama Proposed Drinking Water PAG Alternative I** (EPA 2013 fn 26)	**Obama Proposed Drinking Water PAG Alternative II** (EPA 2013 PAG fn 25)	**Obama Proposed Drinking Water PAG Alternative III** (EPA 2013 PAG fn 27)	**Obama Proposed Drinking Water Alternative IV** (EPA 2013 PAG fn 24a)	**Obama Proposed Drinking Water Alternative V** (EPA 2013 PAG fn 24b)
Iodine-131	0.111	314	314	3000	170	10	300
Strontium-90	0.296	246	246	200	160	10	
Cesium-137	7.4	503	503	2000	1200	10	
Plutonium-239	0.555	27	27	50	2	1	

The second table shows how many times more radioactivity would be permitted in drinking water under the various alternatives compared to the SDWA limits. The extraordinary degree to which EPA proposes increasing permissible concentrations of radionuclides in drinking water is also shown in graphs attached to this letter.

Factors by Which Obama Drinking Water PAG Proposals Would Exceed Existing EPA Safe Drinking Water Levels

Radionuclide	Bush Proposed Drinking Water PAG	Obama Proposed Drinking Water PAG Alternative I (EPA 2013 fn 26)	Obama Proposed Drinking Water PAG Alternative II (EPA 2013 PAG fn 25)	Obama Proposed Drinking Water PAG Alternative III (EPA 2013 PAG fn 27)	Obama Proposed Drinking Water PAG Alternative IV (EPA 2013 PAG fn 24a)	Obama Proposed Drinking Water PAG Alternative V (EPA 2013 PAG fn 24b)
Iodine-131	2829	2829	27027	1532	90	2703
Strontium-90	828	828	676	541	34	
Cesium-137	68	68	270	162	1.35	
Plutonium-239	49	49	90	3.6	1.8	

It makes no sense to require people to drink water with, for example, more than 800 times the concentration of strontium-90 than the levels EPA has historically permitted, or thousands or even tens of thousands of times the permissible iodine-131 levels.[9] We oppose any weakening of drinking water standards for radioactivity. The SDWA limits should be complied with.

We note that the water PAGs are not designed for the immediate, early phase after a release, when actions to protect water supplies might arguably be difficult. Instead, the water PAGs are for the intermediate phase, after the emergency has passed, and are to be in place for one to several years after the emergency. Surely the position of EPA should be that drinking water for such a long period should be protected at levels EPA has deemed acceptable under the Safe Drinking Water Act.

Rather than proposing to force people to drink water contaminated at levels hundreds, thousands, or even tens of thousands of times higher than the EPA has historically considered acceptable under the Safe Drinking Water Act, the PAGs should instead do what they are supposed to do: provide protective action guidance for authorities on how to treat contaminated water or provide alternative drinking water supplies after the immediate emergency has passed. This is, of course, what EPA has historically done in the wake of other emergencies—arranged for treatment or alternative water supplies.

We recommend EPA abandon all efforts to set water PAGs that are weaker than the Safe Drinking Water Act limits, and instead, provide real, concrete guidance to authorities on how to safeguard water supplies so as to protect the public.

[9] EPA has tried to defend these proposals to dramatically increase allowable radioactivity concentrations in drinking water by asserting that the SDWA limits are "based" on a 70-year lifetime exposure. That is not really true. Under SDWA, drinking water is not to contain radionuclides at concentrations above the Maximum Contaminant Limit (MCL) averaged *over a year*. (Even were that not the case, most of the new values proposed are not seventy times higher than MCLs, but hundreds or thousands of times higher). Similarly, the claim that it is appropriate to allow far higher levels of a radionuclide like I -131 because it is relatively short -lived is misdirected. Under SDWA, as indicated above, one already can average the concentration over a year. There is no need to breach the SDWA.

2. The PAGs Propose Dramatically Relaxing EPA's Long-Term Cleanup Requirements

EPA has historically required even the nation's most contaminated sites to be cleaned up to a level deemed protective, defined as within EPA's long-held acceptable risk range, which aims for a risk level of one in a million (10^{-6} risk) but allowing no more than one in 10,000 people exposed to get cancer (a 10^{-4} risk) from that exposure. EPA has thus established Preliminary Remediation Goals (PRGs) for both radionuclides[10] and hazardous chemicals[11] and a flexible process by which, if unusual circumstances make reaching the PRGs difficult, less protective standards can be adopted so long as they are within the risk range. These risk levels have been accepted as reasonable for even huge, heavily contaminated Superfund sites (e.g. Hanford) that are half the size of a state, and thus should not be relaxed in the PAGs. The main reason for the reduction in protection is to save money and liability for industries and agencies that carry out practices that could result in large radioactive contamination, mainly the nuclear power industry and the atomic weapons fuel chain agencies and their contractors.

EPA now proposes in the PAGs that this long-followed protective approach and acceptable risk range be jettisoned and that extraordinarily higher concentrations of radionuclides be allowed to remain in soil for the long-term with no effort at cleanup. While not using the controversial term "optimization" from the Bush-era proposed PAGs, language in the PAGs could permit some to say that EPA now merely proposes optimization without calling it that. No risk-based cleanup standards for long-term cleanup would be established in the PAGs, even as a baseline, but rather a vague, undeveloped, makeshift process would be followed whereby cleanup standards would be established after the fact, based on factors other than public health. For example, the PAGs contemplate letting the desire of industry or federal agencies to not have to pay for cleaning up contamination they have created by a release override the public's need to be protected. This is unacceptable.

Just as EPA tried to relegate the proposed weakening of drinking water standards to footnotes, EPA also appears to be trying to weaken long-term cleanup standards by vague references to the DHS 2008 PAGs and by cooperating with an outside group with strong nuclear ties, the National Council on Radiation Protection and Measurements (NCRP) which recommends grossly weakened cleanup guidelines via an NCRP guidance document.

Especially troubling is the process by which EPA chose to pursue the path of weakening long-term protection of the public. For example, two EPA staffers from relevant EPA Offices[12]

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10 http://epa-prgs.ornl.gov/radionuclides/

11 http://www.epa.gov/reg3hwmd/risk/human/rb -concentration_table/index.htm
These regional values are used nationally.

12 John Edwards, head of the radiation protection division of the Office of Radiation and Indoor Air, and John Cardarelli from the Office of Emergency Management. EPA claims they participated with NCRP on their own but has not provided evidence that they took time off and that the activity was not approved by their superiors at EPA.

influential in developing the EPA PAGs participated in writing the NCRP guidance document which presses EPA to weaken, to an extraordinary degree, its long-term cleanup standards. This is significant because EPA staff from other Offices attempting to retain existing radiation protection levels were not included on the NCRP team. This internal EPA conflict and the apparent conflict of interest in EPA staff participating at all in the private NCRP effort at pushing EPA to relax its cleanup goals, while representing only one side of the internal EPA debate, has been reported on in the media, pursued via Freedom of Information Act requests and a letter from Public Employees for Environmental Accountability to then-EPA Administrator Jackson[13] but EPA has failed to respond meaningfully.

The EPA PAGs DO NOT incorporate the full DHS PAGs on long-term cleanup, only a subsection dealing with general process matters about consultation (reprinted in section 4.1.6 of the EPA PAGs, pp. 55-59). The DHS PAGs sections on "optimization" and use of benchmarks for long-term cleanup are *not* included in the EPA PAGs. However, a single sentence elsewhere in the EPA PAGs (p. 4, para 4), mentions incorporation of guidance from DHS PAGs' long-term cleanup section, presumably referring to the subsection that is inserted. This poorly crafted sentence, if not clarified, can create subsequent confusion as to whether EPA is incorporating all of the DHS PAGs on long-term cleanup or only the generally innocuous section that is in fact incorporated directly. Since the DHS PAGs are explicitly based on "optimization," and the EPA PAGs are not, and since the DHS PAGs reference "benchmarks" from nuclear advocacy groups like ICRP, NCRP, and IAEA, which have pushed for "acceptable" long-term doses as high as 10 rem per year, with consequent cancer risks as high as 1 cancer per 2 people exposed, whereas the EPA PAGs do not, this potential confusion must be eliminated.

EPA should remove any implication from its PAGs that it is incorporating the DHS PAGs' "optimization" plan and contemplated use of "benchmarks." We recommend that the sentence on p. 4 be rewritten to state, "This EPA Manual substantively incorporates in Section 4.1.6 (pp.55-59) a specific subsection of the late phase cleanup guidance provided in the 2008 DHS document and refers readers to additional planning resources."

The NCRP report--which claims it is designed to provide guidance for both the DHS and EPA PAGs--recommends long-term cleanup standards of 100 to 2000 millirem per year (0.1 to 2 rem per year). That is the equivalent of 50 to 1000 chest X-rays annually, or one a week to three a day every day of one's life for decades. By EPA's own cancer risk estimates, 2 rem per year over a lifetime would result in an excess cancer in one in every six people exposed. Because of the increased risk in earlier years, EPA estimates that even just thirty years exposure from birth would result in a cancer in one in eight people exposed.[14] These risk levels are orders of magnitude higher than EPA's long-accepted risk range.

Additionally, NCRP proposes specific levels of radionuclides that should be allowed to remain in soil and not cleaned up, with people exposed for decades to that radiation without protective actions having been undertaken. Those levels are extraordinarily higher than EPA's

[13] http://www.nti.org/gsn/article/epa -withholds-information-dirty-bomb-report-amid-cancer-concerns/; http://www.peer.org/assets/docs/epa/ 4_5_10_PEER_Radiation_ltr_to_EPA.pdf

[14] See footnote 3 above.

Preliminary Remediation Goals (PRGs), or even the upper limit of EPA's acceptable residual contamination (one hundred times the PRG). We have attached tables and figures showing the extreme exposures these proposals would produce compared to anything EPA has ever said in the past was acceptable. For some radionuclides, the NCRP proposed "acceptable" contamination levels would be hundreds of thousands or even millions of times higher than what EPA's remediation goals are at the nation's most contaminated sites, for the same exposure scenario.

We thus oppose the long-term cleanup section of the EPA PAG as written, and any potential linkage of the EPA PAG to DHS' PAGs' "optimization" process and/or to the NCRP recommendations or those of other bodies that push for increased radiation exposures of the public.[15] EPA should stick to its longstanding principles and require cleanup to its standards for the most contaminated sites in the country, CERCLA. In extraordinary circumstances, there are already provisions whereby one can make an exception if one absolutely has to, but even then one still aims to get as close to the CERCLA risk range as possible. The PAGs as written, however, suggest a concerted attack by proponents of weakening public protections, and this should not be allowed.

3. <u>The Elimination of Relocation PAGs for High Thyroid and Skin Doses and for High Projected Cumulative Whole Body Doses</u>

EPA's 1992 PAGs, which the current document revises, require relocation if thyroid or skin doses over certain specified limits are predicted. Again, it is important to remember that PAGs are doses that are to be *avoided* by protective actions. The new PAGs eliminate both requirements. We believe that is inadvisable.

EPA claims it is removing the skin and thyroid relocation PAGs to "avoid confusion." This makes no sense. If predicted doses to the skin or thyroid are likely to be very large, one needs to be protecting people by getting them out of harm's way. The fact that some people in some situations may have access to potassium iodide (KI) doesn't obviate the need to relocate those who don't. And KI does nothing to protect against skin cancer; its sole use is aimed at the thyroid.

Additionally, the longstanding PAGs require protective action to assure people do not get exposed to more than 5 rem over 50 years. This has been jettisoned as well. Obviously, if some within EPA are pushing to allow long-term doses as high as 2 rem per year over many decades (60 rem over 30 years, 140 rem over a lifetime), a 5 rem cumulative cap would prevent that. That apparently is behind their desire to eliminate the lifetime cap. The cap should remain and in fact be tightened considerably (see discussion in section 6 below).

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[15] We incorporate herein by reference comments submitted on the NCRP recommendations, found at http://committeetobridgethegap.org/wp -content/uploads/2013/04/ncrp -short-comments-from-multiple-groups.pdf and http://committeetobrid gethegap.org/wp-content/uploads/2013/04/CBGNIRSPSRSCFS -updated.pdf

4. <u>The Recommendation to Permit Radioactive Waste to Be Disposed of In Unlicensed Disposal Sites, Including Regular Municipal Garbage Dumps</u>

Nuclear advocates have long pushed to deregulate significant portions of the radioactive waste stream and permit such wastes to be disposed of in sites neither licensed nor designed for radioactive materials, including municipal garbage dumps. This has largely been driven by a desire to cut safety corners so as to save money for industry and government.

The PAGs strongly push for elimination of the existing requirements that radioactive waste go to sites licensed and designed for radioactive waste. We oppose such an effort. Again, EPA seems intent on weakening protections. PAGs are supposed to be guides for *protective action*, not an effort to eliminate protections.

The section on waste disposal issues in Chapter 4 of the PAGs, *Guidance for the Late Phase,* appears to have been written with little or no historical knowledge about the widespread public opposition over past decades in the United States to proposals for deregulation, free release, clearance or below-regulatory-concern (BRC) designation of radioactive waste from both nuclear power and weapons facilities. The suggestion to allow nuclear waste into RCRA C and D Hazardous and Solid waste facilities is both cavalier and dangerous. Allowing the waste to go into and contaminate or poison commercial recycling has also been soundly rejected. We oppose sending nuclear waste to facilities that are not specifically licensed for radioactive materials, including but not limited to solid and hazardous landfills, incinerators, processors and recycling facilities.

Some of the reasons to keep nuclear waste out of facilities not specifically licensed for radioactive materials include inevitable leakage, the potential intermixing of radioactive materials with chelating and organic complexing agents that greatly enhance the migration of the radioactivity into groundwater and surface water, risk of fire in a landfill with both radioactive and regular wastes as is currently occurring at the West Lake landfill in Missouri, failure to consider the ability of RCRA facilities to isolate the wastes they are licensed to dispose, shorter institutional control periods, failure to inform and protect workers, and lack of detailed radiation monitoring of air, soil, and water. Recycling radioactively contaminated materials into the consumer metal supply rather than disposing of them in licensed radioactive sites is not acceptable.

EPA should have reviewed the public comments which clearly rejected their previous efforts[16] in the mid 1990's, 2001 and 2003 to allow nuclear waste into solid and hazardous facilities and into recycling to make consumer goods.

EPA gives lip-service to inclusivity in the PAGs, ignoring the reality that deregulating (or never requiring radioactive regulation) of nuclear waste from incidents and releases will

[16] 1996-1998 EPA consideration, publication and rejection of rules to legalize contaminating metal recycling with radioactive metal; 2001 66 Fed Reg 27218 May 16, 2001 to allow mixed waste to go to nuclear waste sites; 2003 ANPR 65120 68 Fed Reg 222, Nov 18, 2003 to consider "non -regulatory approaches" for radioactive waste management.

disproportionately impact people of color and low income communities which is where the solid and hazardous waste facilities frequently are located and where new ones tend to get sited.

We encourage EPA, the other federal agencies and states to focus their efforts on *preventing* nuclear power incidents rather than pushing to relax cleanup and disposal safety requirements.

5. The Inappropriate Expansion of the PAGs to Cover Essentially All Radioactive Releases, from The Most Extraordinary (e.g. Nuclear Weapons Explosions) to Those Far Less Consequential (e.g. Small Transportation Accidents)

The DHS PAGs mixed the absolutely extraordinary event—detonation by a terrorist of a nuclear weapon in the U.S.—with vastly less consequential events involving "dirty bombs" of a range of sizes, including very small ones. It was inappropriate to suggest the same standards for such varying incidents. If a nuclear bomb explodes, all bets are off. If a small dirty bomb is detonated, normal response procedures and cleanup requirements can take care of it. By mixing the huge and the small and requiring the same lax standards, a disservice is being done.

EPA has now greatly compounded that problem by expanding its PAGs from dealing with a catastrophic release from a nuclear power plant meltdown to covering all radioactive releases, including such events as transportation accidents and incidents at radiopharmaceutical facilities.[17] Indeed, under the PAGs definition of its scope—dealing with any radioactive release for which a protective action may be required—it is hard to see what might not be covered or how CERCLA, which is EPA's longstanding statutory program for dealing with such releases would still exist, despite *pro forma* language in the PAG to the contrary.

By creating a single set of standards to address both a Fukushima-type event and a truck carrying a shipment of medical isotopes that goes off the road, one creates a useless PAG and the prospect of greatly relaxed cleanup and protection standards for many events for which there is no question that current standards and response approaches under CERCLA are fully adequate. We oppose this effort to expand the PAGs to essentially encompass every radioactive release.

6. Relying on PAG Dose Limits As High As Or Higher Than Those In Effect Decades Ago Despite the Fact That Official Estimates of Cancer Risks from Radiation Have Increased Significantly Over That Period

In addition to eliminating some important dose triggers for protective action in the older PAGs, EPA carries forward old limits that have been in place for decades, despite EPA's own official estimates of radiation risk per unit dose having markedly increased during that time. The updated official consensus is that radiation is considerably more harmful than was known when the earlier levels were established. EPA fails to improve protection based on the newer, higher

[17] EPA PAG Manual 2013, page 4 section 1.3.4 "This updated Manual applies PAGs and protective actions to an expanded range of sources of potential radiological releases, include commercial nuclear power facilities, uranium fuel cycle facilities, nuclear weapons facilities, transportation accidents, radiopharmaceutical manufacturer and users, space vehicle launch and reentry, RDDs and INDs."

risk, and in fact allows for reduced protection instead. For example, the 1992 PAG values incorporated into the newest PAG are based on the National Academy of Sciences' BEIR III study (and in fact, go even far further back than that). But BEIR V increased those risk estimates three- or four-fold, and BEIR VII increase those an additional 35%. EPA has adopted those values in its most recent Blue Book. So, despite officially acknowledging that radiation is four or five times more dangerous than assumed when the 1992 PAGs were established, EPA now merely uses the same dose limits without any effort to tighten them by a factor of four or five.

We recommend that all parts of the PAGs that weaken or eliminate existing protections be abandoned, and all dose limits be tightened by at least the increased risk EPA now acknowledges for radiation.

7. The PAGs Incorporate Archaic and Extremely High FDA Food Contamination Guidelines, Apparently Without Updated Review

EPA simply by reference incorporates old FDA guidelines for food contamination. These food radiation exposures would be on top of doses from other exposures (e.g., inhalation, groundshine) adding significantly to cumulative doses to the public. The old FDA guidelines are based on even older guidance, and none of the dose limits have been reduced over time to reflect the increased official risk estimates discussed above.

The old FDA guidance allows—from the food pathway alone—500 millirems exposure per year. This means that the food one eats each day would produce a radiation dose equivalent of a chest X-ray every day. The FDA food guidance limits appear to have no time limit; food contaminated at these levels would be permitted to be consumed over a lifetime. At these dose levels, EPA's risk estimates indicate a lifetime risk of 4×10^{-2}, or every 25th person eating food contaminated at those levels getting a cancer from it. This is simply unacceptable, and EPA should reject any such proposed guidance. At minimum, if EPA really intends to accept such doses, it should be candid with the public and say that those "acceptable" levels, by its own estimate, would produce an excess cancer in 4% of the public. We think that would be a hard sell ethically, and EPA should thus rethink adoption of such extraordinarily lax protection levels.

SUMMARY OF RECOMMENDATIONS

We recommend the April 2013 draft PAGs be withdrawn.

We oppose any weakening of drinking water standards for radioactivity. The Safe Drinking Water Act limits should be complied with. The PAGs should do what they are supposed to do: provide protective action guidance for authorities on how to treat contaminated water or provide alternative drinking water supplies over the one to several years after the immediate emergency has passed. This is, of course, what EPA has historically done in the wake of other emergencies—arranged for treatment or alternative water supplies.

We recommend EPA abandon all efforts to set water PAGs that are weaker than the Safe Drinking Water Act limits, and instead, provide real, concrete guidance to authorities on how to safeguard water supplies so as to protect the public to those levels or better.

The PAGs contemplate letting the desire of nuclear industry and federal agencies to not have to pay for cleaning up contamination they have created by radioactive releases override the public's need to be protected. This is unacceptable.

EPA should remove any implication from its PAGs that it is incorporating into responding to non-terrorist radiological events the Department of Homeland Security PAGs' "optimization" plan and contemplated use of "benchmarks" that would be outside EPA's historical acceptable risk range.

We oppose the long-term cleanup section of the EPA PAG as written, and the potential linkage of the EPA PAG to DHS' PAGs' "optimization" process, and to the NCRP recommendations or those of other bodies that push for increased radiation exposures of the public. EPA should stick to its longstanding principles and require cleanup to its standards for the most contaminated sites in the country, CERCLA. The PAGs as written suggest a concerted attack by proponents of weakening public protections, and this should not be allowed.

Do not remove, but instead retain and strengthen, relocation PAGs for thyroid and skin doses.

Do not remove, in fact EPA should strengthen, the longstanding PAGs that require protective action to assure people do not get exposed to more than 5 rem over 50 years.

The outdated FDA food contamination guidelines should be replaced with markedly lower permissible concentrations of radioactivity in food.

We oppose sending nuclear waste to facilities that are not specifically licensed for radioactive materials including but not limited to solid and hazardous landfills, incinerators, processors and recycling facilities. We encourage EPA, the other federal agencies and states to focus on *preventing* nuclear power incidents rather than weakening protection of the public in case of such releases.

We oppose the effort to expand the PAGs to essentially encompass every radioactive release.

We recommend that all parts of the PAGs that weaken or eliminate existing protections be abandoned, and all dose limits be tightened by at least the increased risk EPA now acknowledges for radiation.

<u>Conclusion</u>

Protective Action Guides are supposed to provide guidance for actions to protect the public from radiation. The current PAGs do the opposite—recommend grossly increased risks to the public without protection. We urge that the PAGs be withdrawn.

Sincerely,

National

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<u>Notes</u>

As to the water PAGs, please note that EPA's Alternative 1, identified in footnote 26 of the PAG, is for the same high dose limit that was put forward in the Bush EPA PAG. EPA had previously identified in the Bush PAG radionuclide concentrations it claimed were associated with that dose, so we used here those concentrations. Secondly, Alternative 4, the first alternative in footnote 24 of the PAG, is really not a set of proposed water limits for emergencies but a set of weaker standards for normal consumption of drinking water and not really relevant to the PAG discussion. Lastly, Alternative 5, the second reference in PAG footnote 24, provides a value for only one radionuclide, iodine-131.

The NCRP's suggested long-term cleanup levels are found in NCRP SC 5-1 Draft Report, "Decision Making for Late-Phase Recovery from Nuclear or Radiological Incidents," February 25, 2013, National Council on Radiation Protection and Measurements.

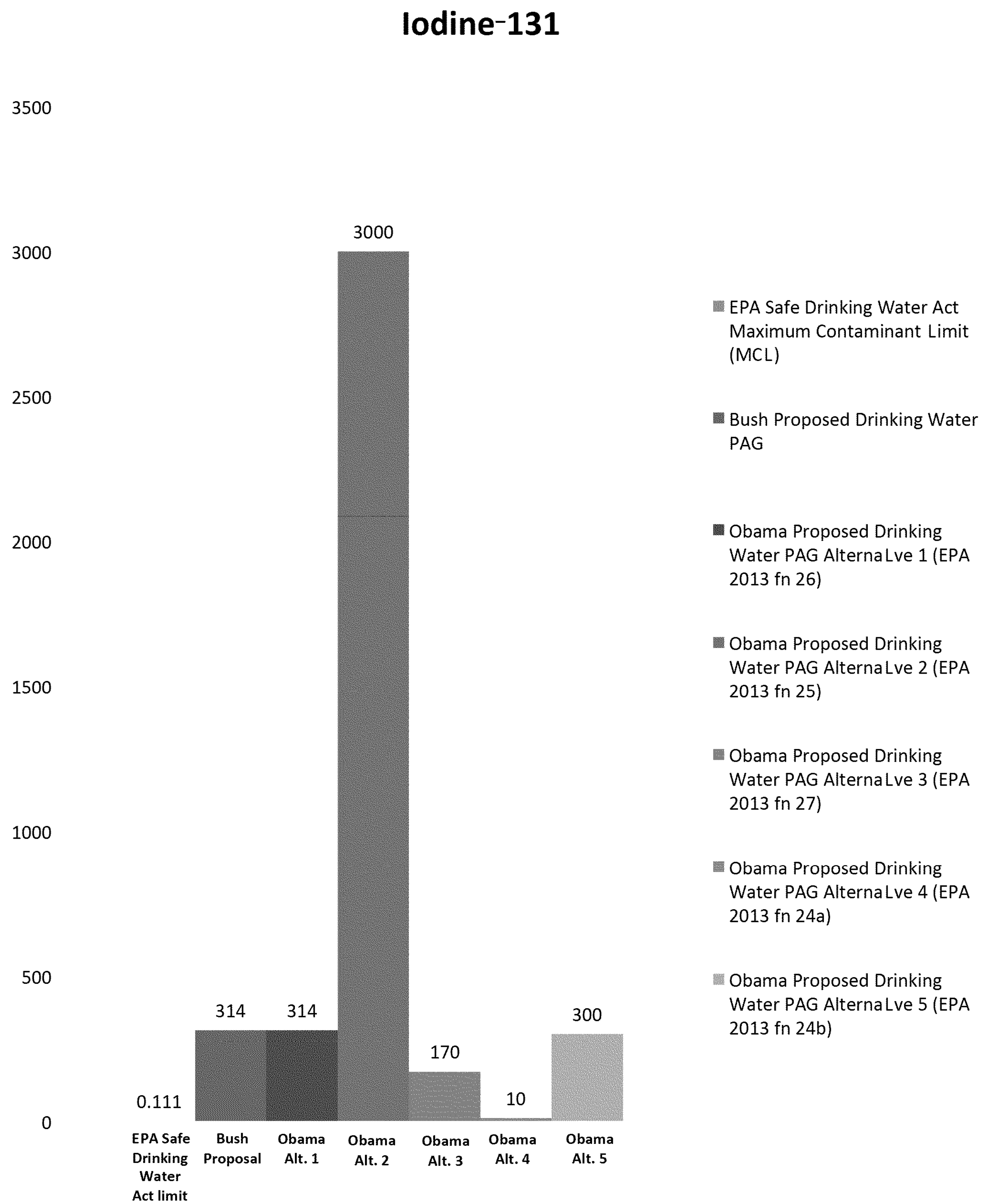
Table 6.4 of the report identifies levels of contamination below which no cleanup would occur based on a 1 mSv/yr dose, for resident farmer, urban resident, and industrial/commercial exposure pathways, and for 95th and 50th confidence intervals. The NCRP report recommends cleanup choices based on a dose range of 1 mSv/yr to 20 mSv/yr (100 mrem to 2000 mrem/yr) and indicates that one just scale up the values in Table 6.4, which are based on 1mSv/yr, to be obtain the concentrations for the 20 mSv/yr limit.

We have taken the NCRP values and compared them to EPA's Preliminary Remediation Goals (PRGs) for the same exposure scenarios—resident farmer and urban resident. We have compared the EPA PRGs to both the 50th and 95th confidence levels concentrations identified by the NCRP report.

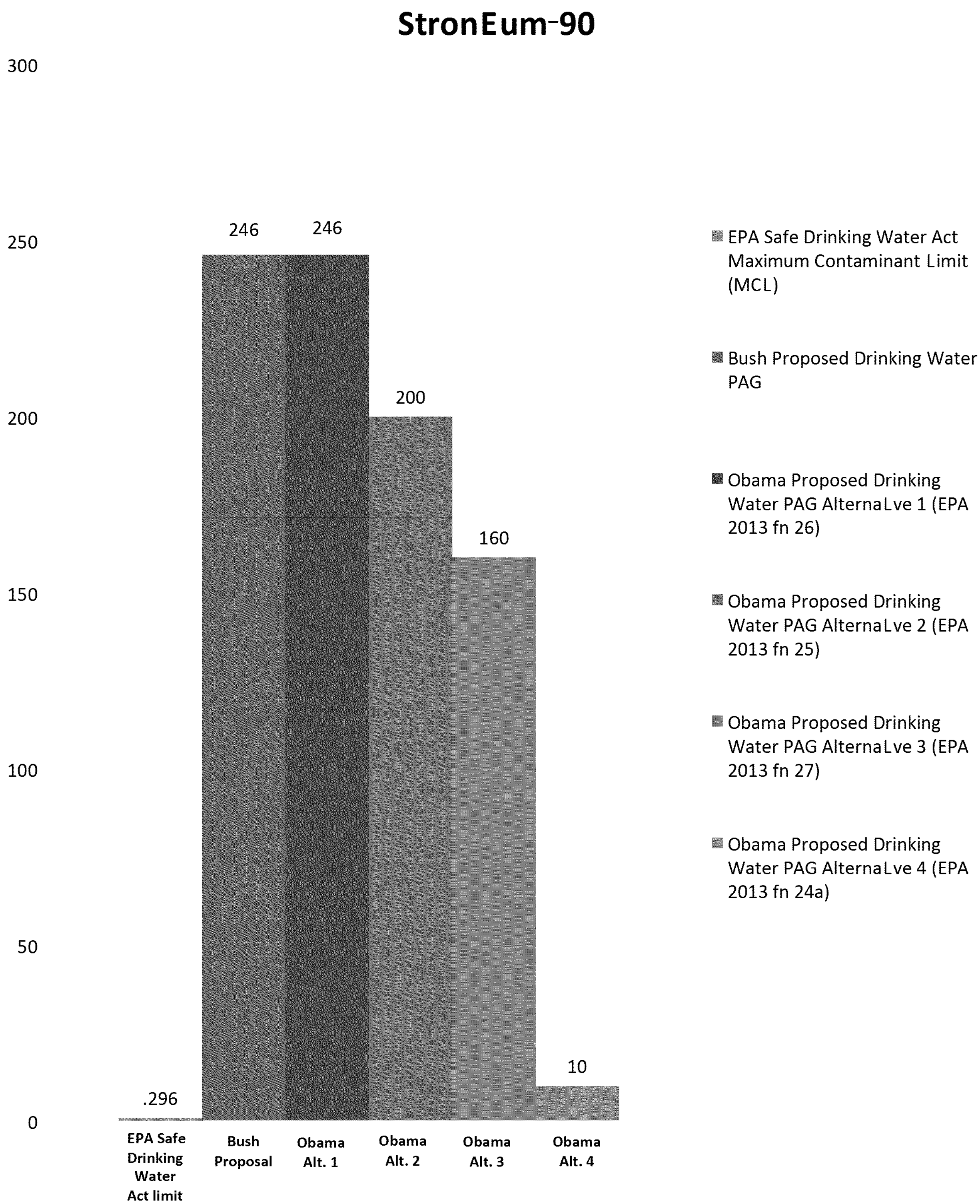
It should be noted that EPA PRGs are the remediation goals, and that in unusual circumstances where one can't meet the goal one can fall back from them, but no more than by two orders of magnitude. In other words, EPA's remediation levels are a range of the PRG to no more than 100 times the PRG. Thus, at the upper end of the NCRP proposed acceptable risk range, for example, for a resident farmer and a 50% confidence interval, NCRP proposed plutonium-239 levels nearly 12 million times higher than EPA's PRG for the same scenario. That would be 120,000 times higher than the upper limit of EPA's risk range.

We gratefully acknowledge the work of Ryan Forster in producing the graphs.

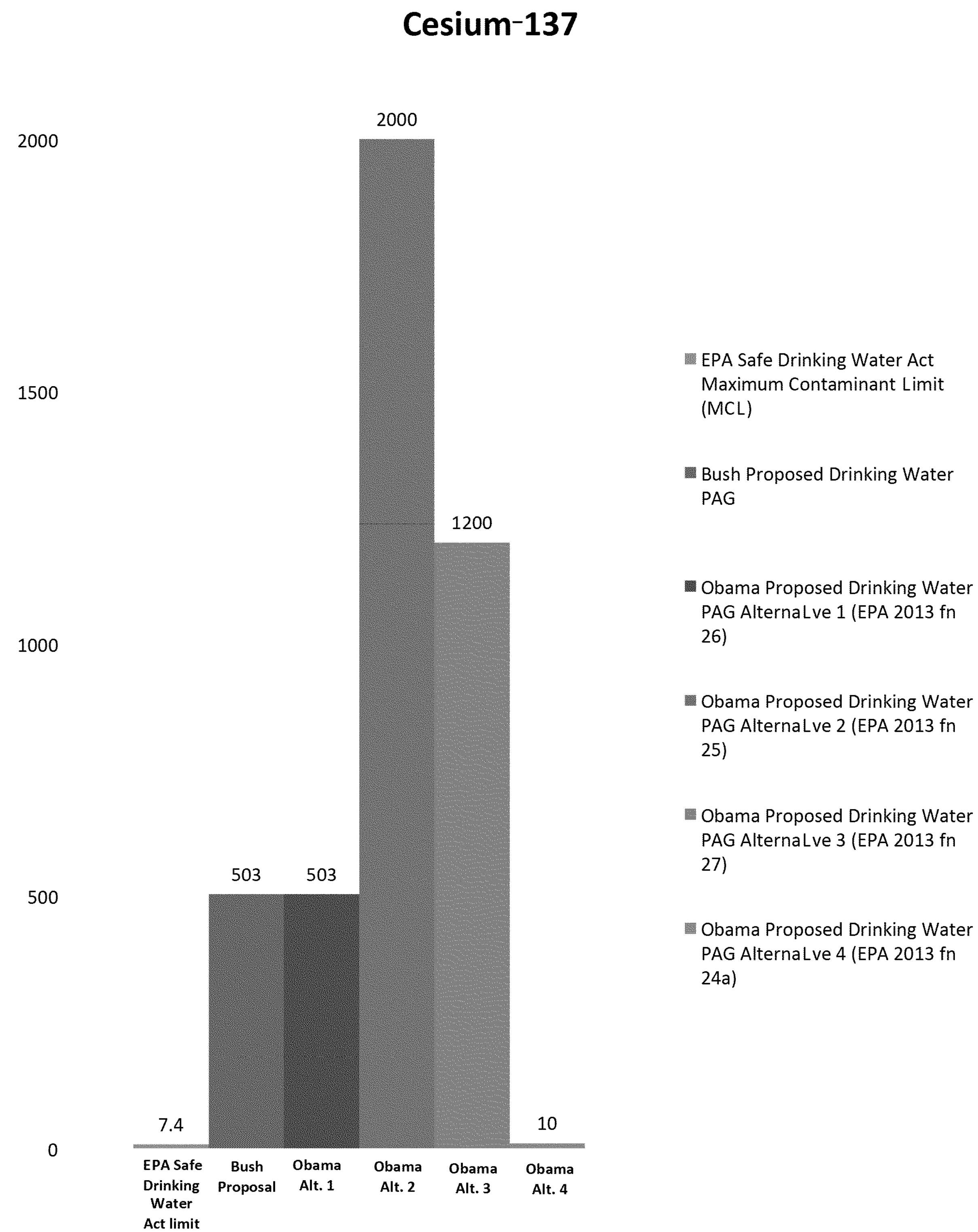
Allowable Radionuclide Concentrations in Water Under the EPA's Safe Drinking Water Act Limits Compared with Alternatives Identified in Proposed Protective Action Guides, in Bq/L



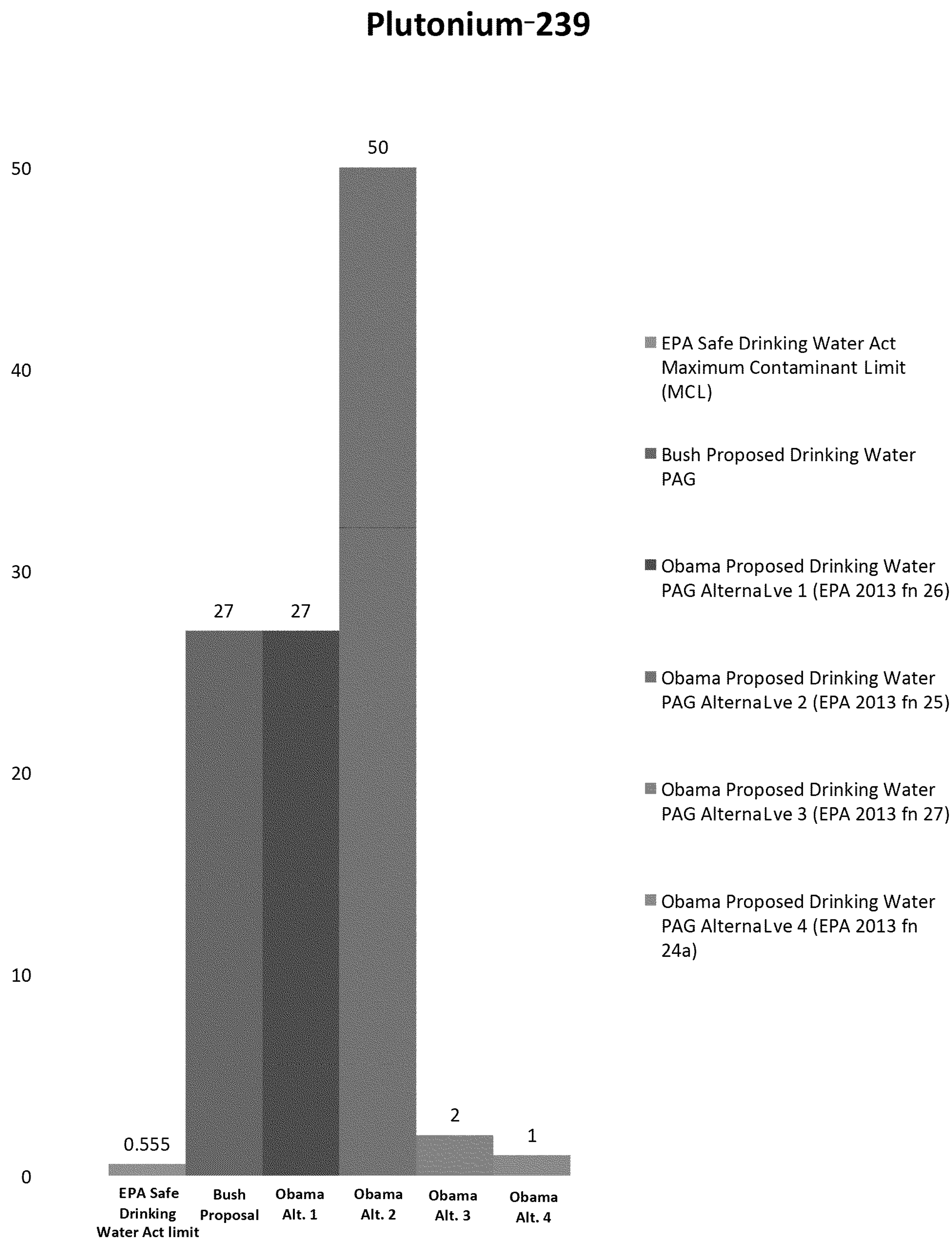
Allowable Radionuclide Concentrations in Water Under the EPA's Safe Drinking Water Act Limits Compared with Alternatives Identified in Proposed Protective Action Guides, in Bq/L



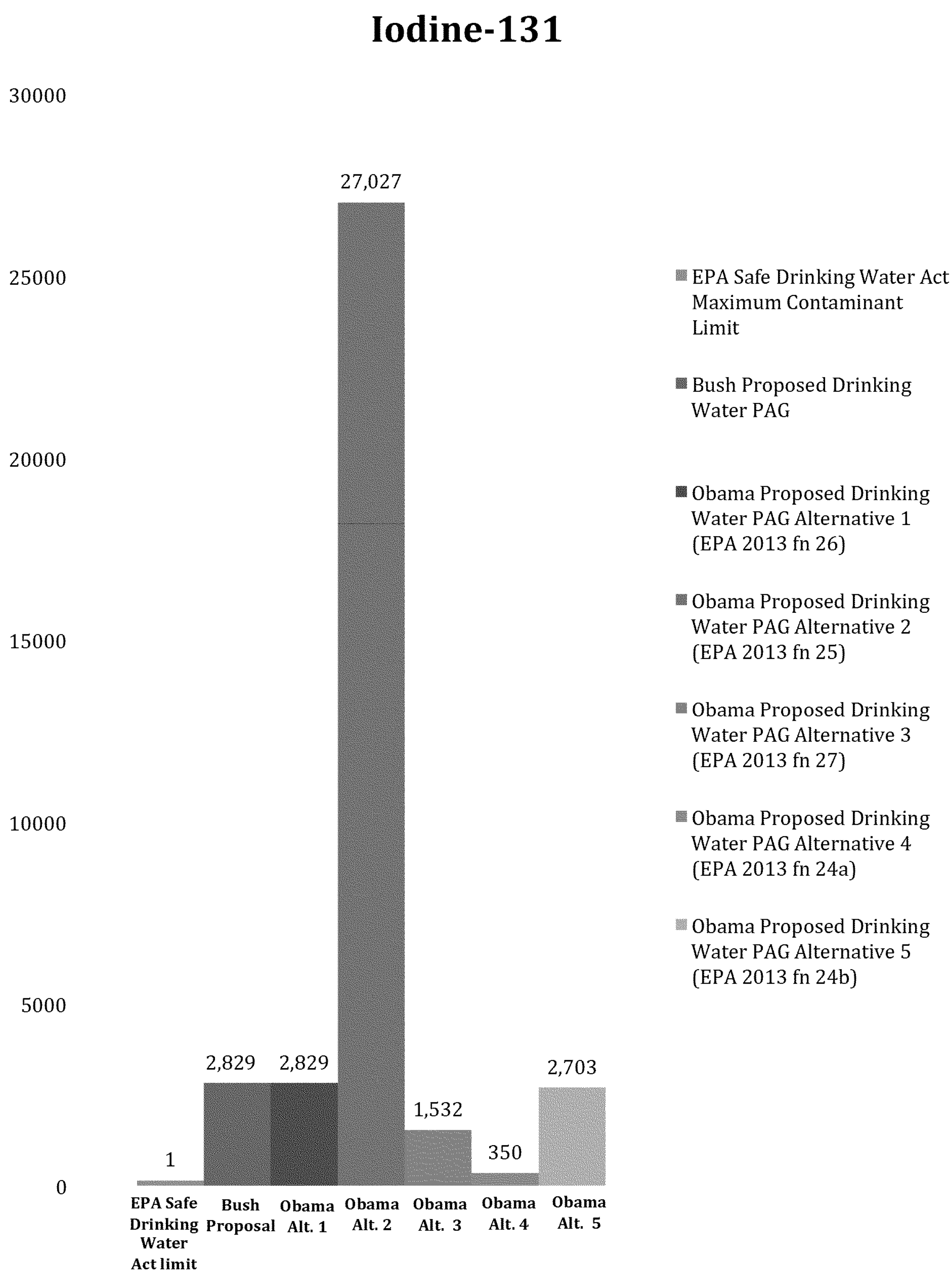
Allowable Radionuclide Concentrations in Water Under the EPA's Safe Drinking Water Act Limits Compared with Alternatives Identified in Proposed Protective Action Guides, in Bq/L



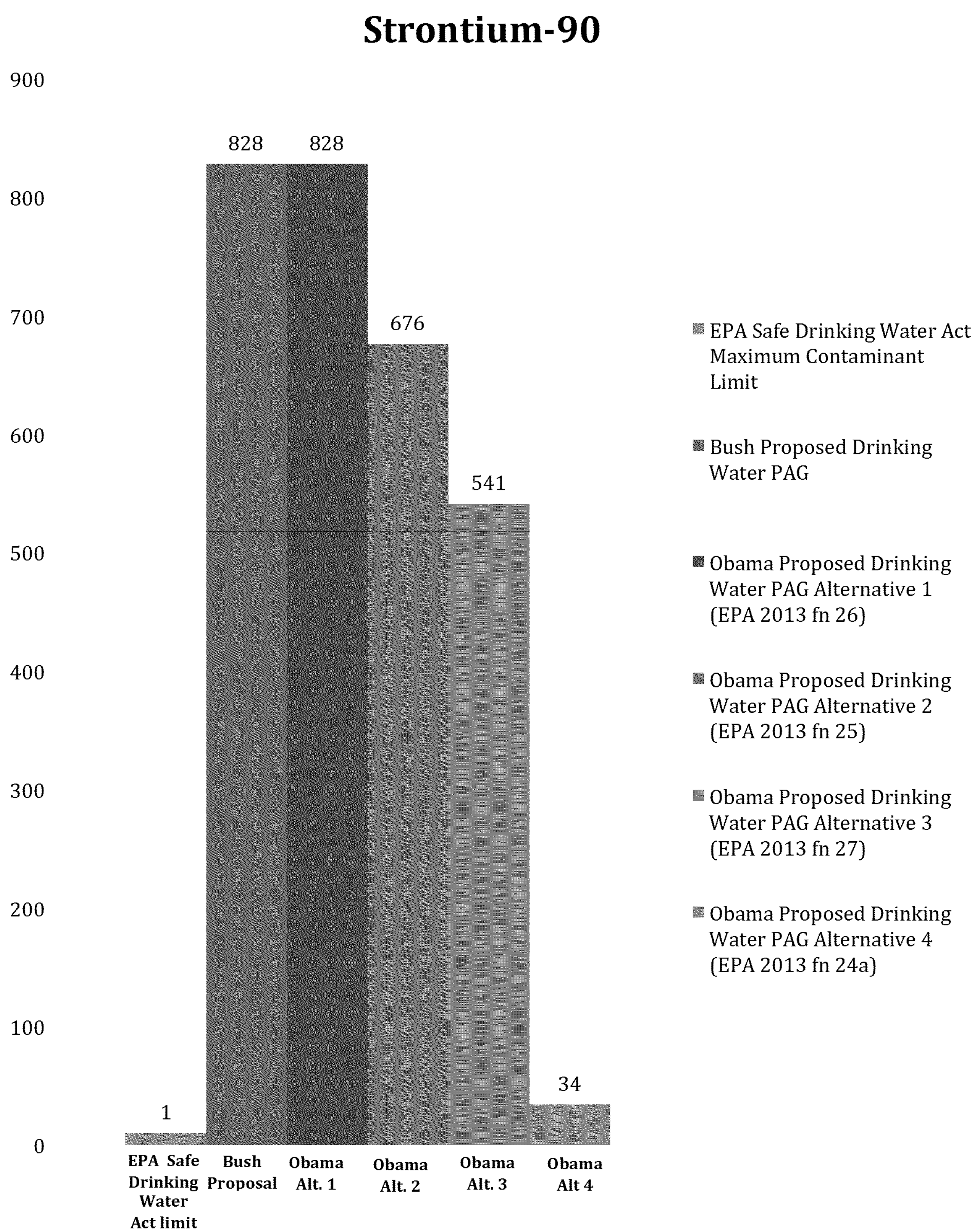
Allowable Radionuclide Concentrations in Water Under the EPA's Safe Drinking Water Act Limits Compared with Alternatives Identified in Proposed Protective Action Guides, in Bq/L



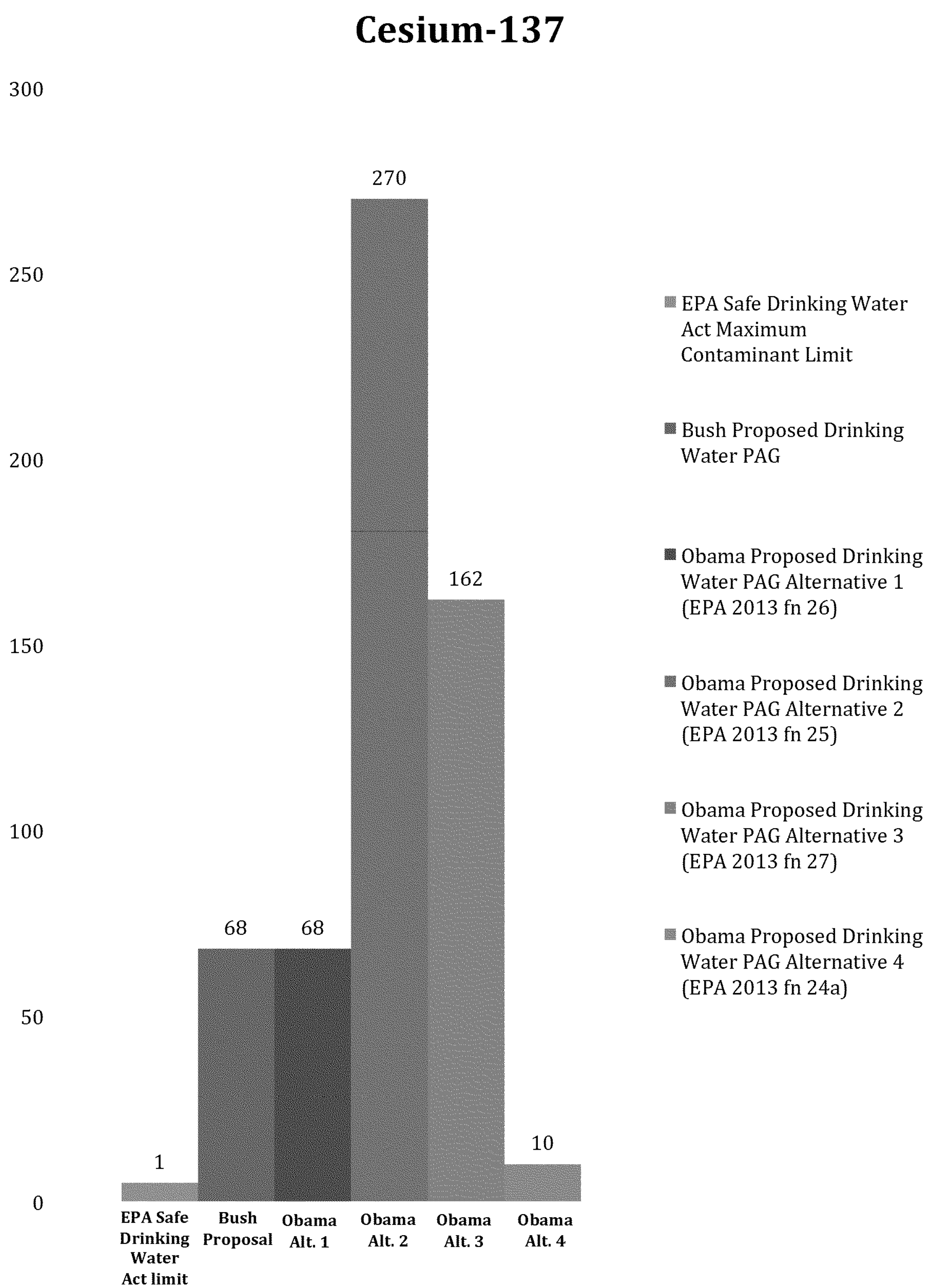
Factors by Which Radionuclide Concentrations in Drinking Water Would Exceed EPA's Safe Drinking Water Act Levels if the Alternatives Identified in 2013 Proposed Protective Actions Guides Were Adopted



Factors by Which Radionuclide Concentrations in Drinking Water Would Exceed EPA's Safe Drinking Water Act Levels if the Alternatives Identified in 2013 Proposed Protective Actions Guides Were Adopted



Factors by Which Radionuclide Concentrations in Drinking Water Would Exceed EPA's Safe Drinking Water Act Levels if the Alternatives Identified in 2013 Proposed Protective Actions Guides Were Adopted



Factors by Which Radionuclide Concentrations in Drinking Water Would Exceed EPA's Safe Drinking Water Act Levels if the Alternatives Identified in 2013 Proposed Protective Actions Guides Were Adopted

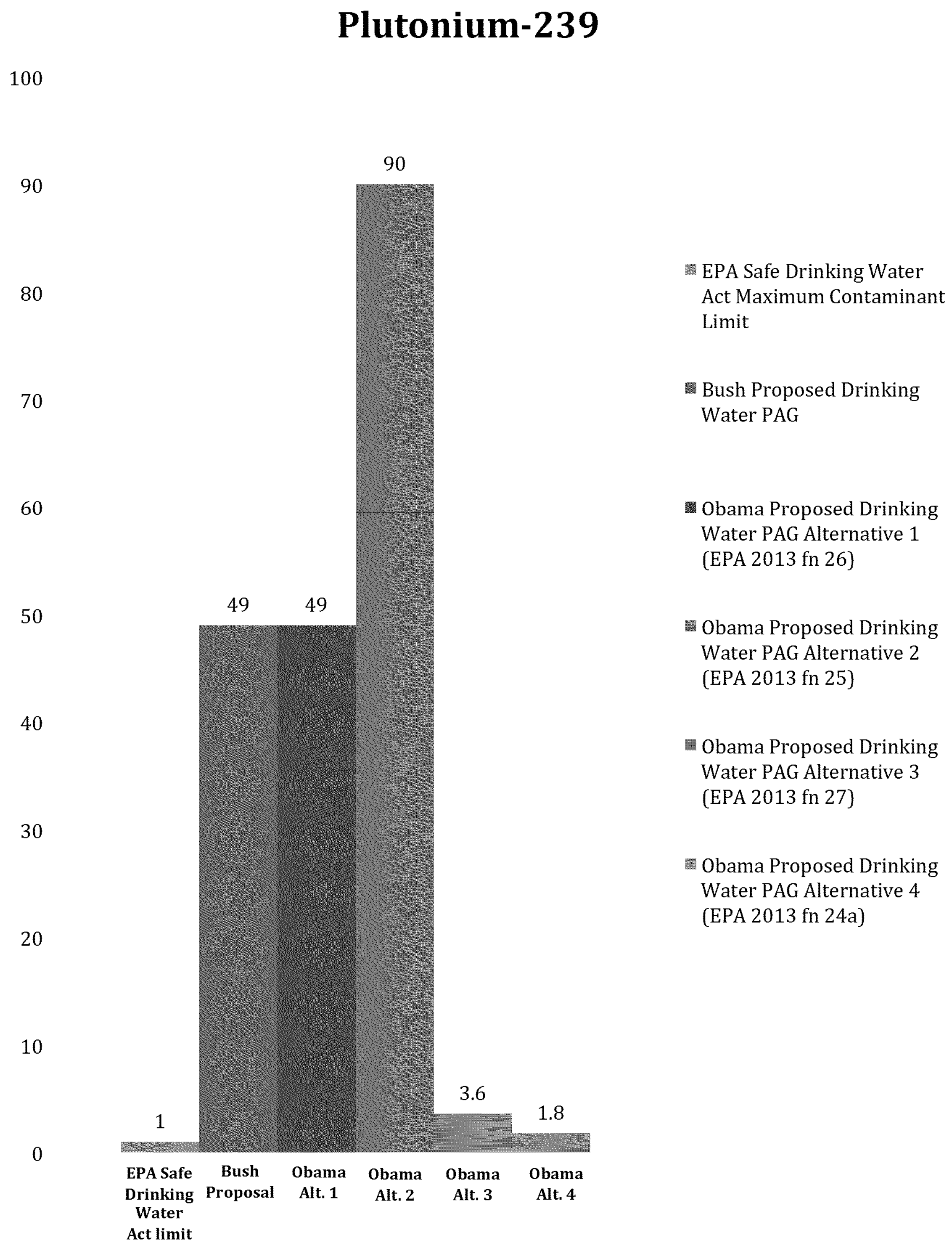


FIGURE 1a

How Many Times More Radioac2vity Would be Permi : ed in Soil for Farmers Under NCRP Proposal Compared to EPA's Remedia2on Goals

(@ 95% Confidence Level)

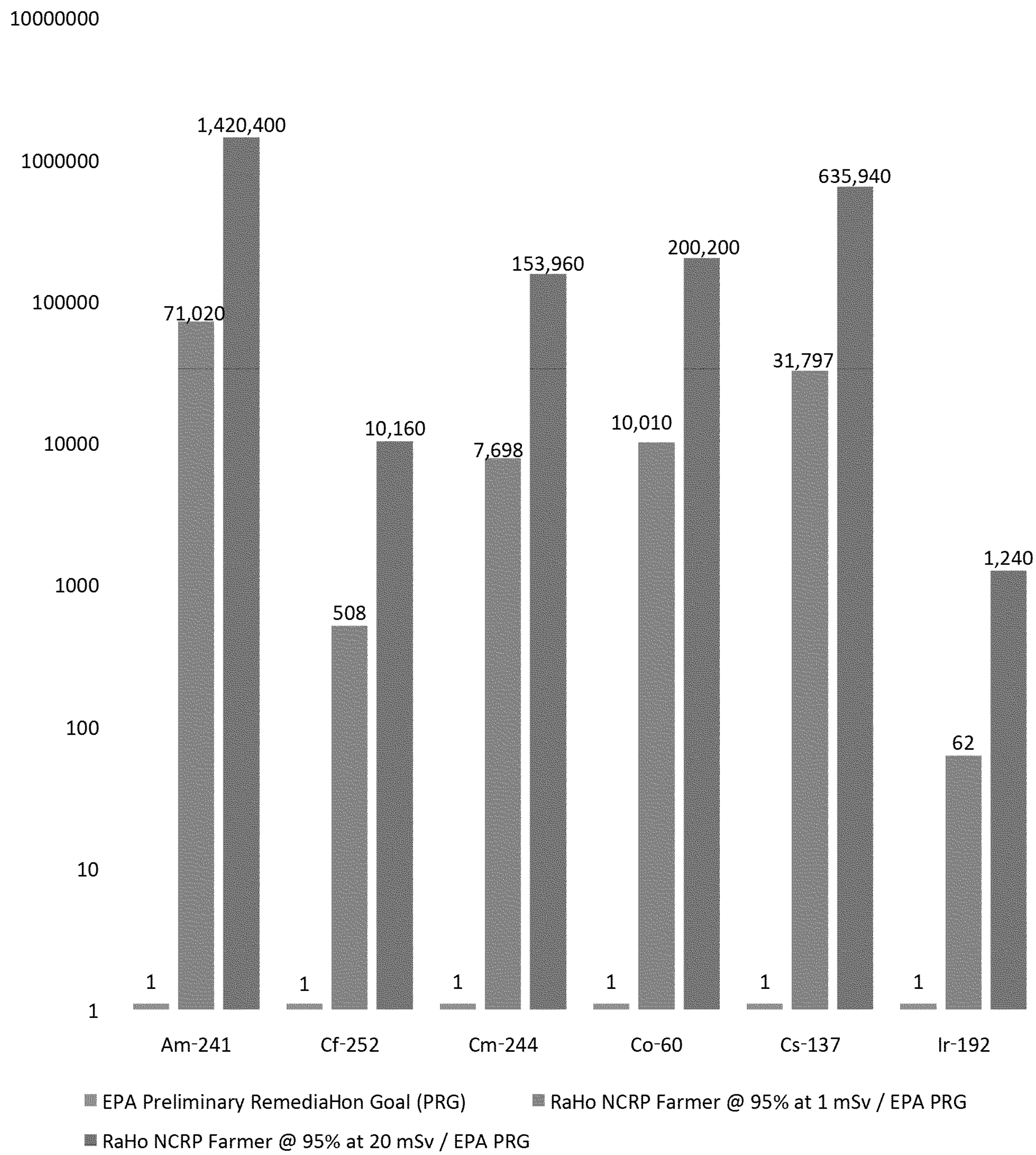


FIGURE 1b

How Many Times More Radioac2vity Would be Permi : ed in Soil for Farmers Under NCRP Proposal Compared to EPA's Remedia2on Goals

(@ 95% Confidence Level)

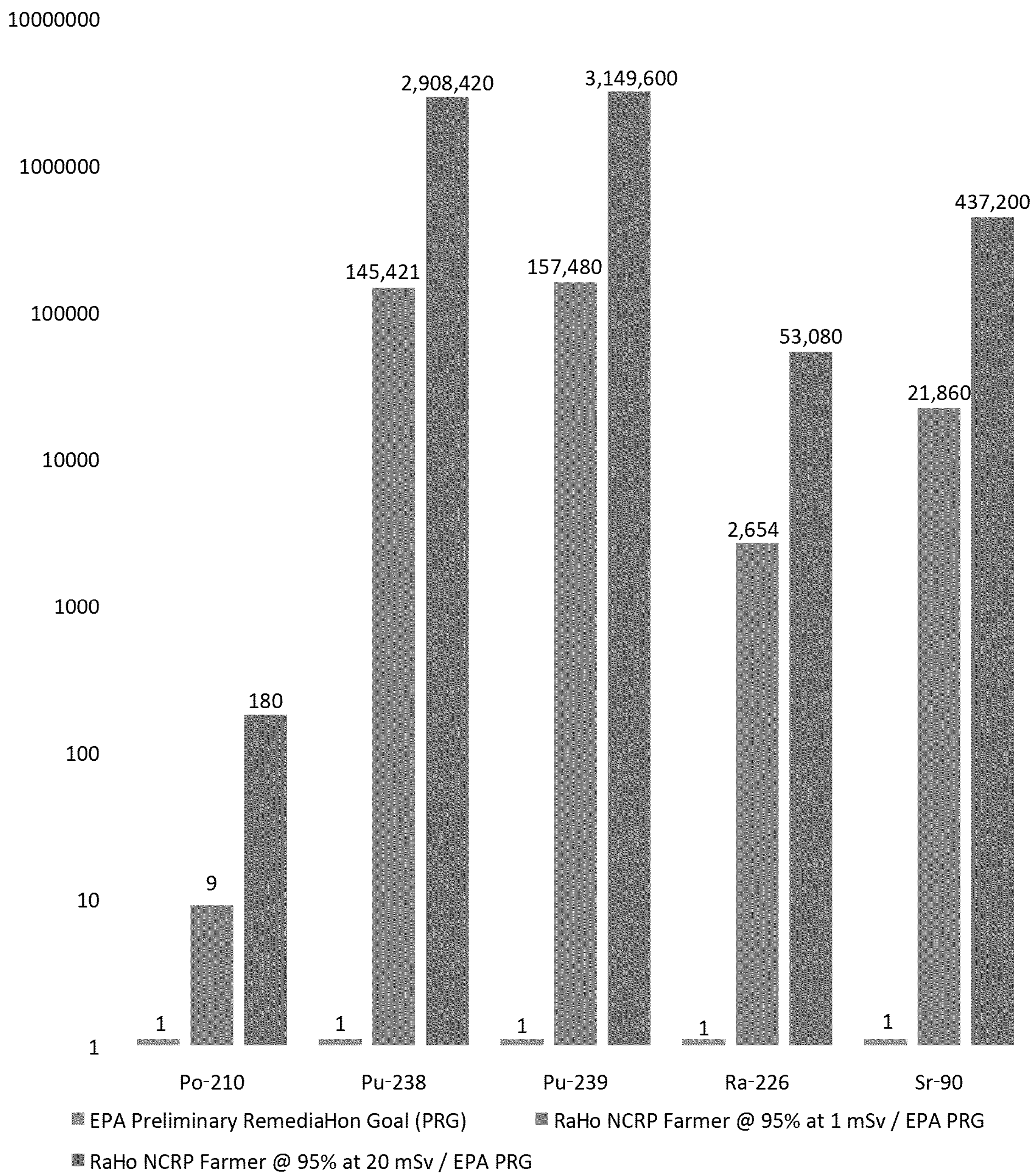


FIGURE 2a

How Many Times More Radioac2vity Would be Permi : ed in Soil for Farmers Under NCRP Proposal Compared to EPA's Remedia2on Goals

(@ 50% Confidence Level)

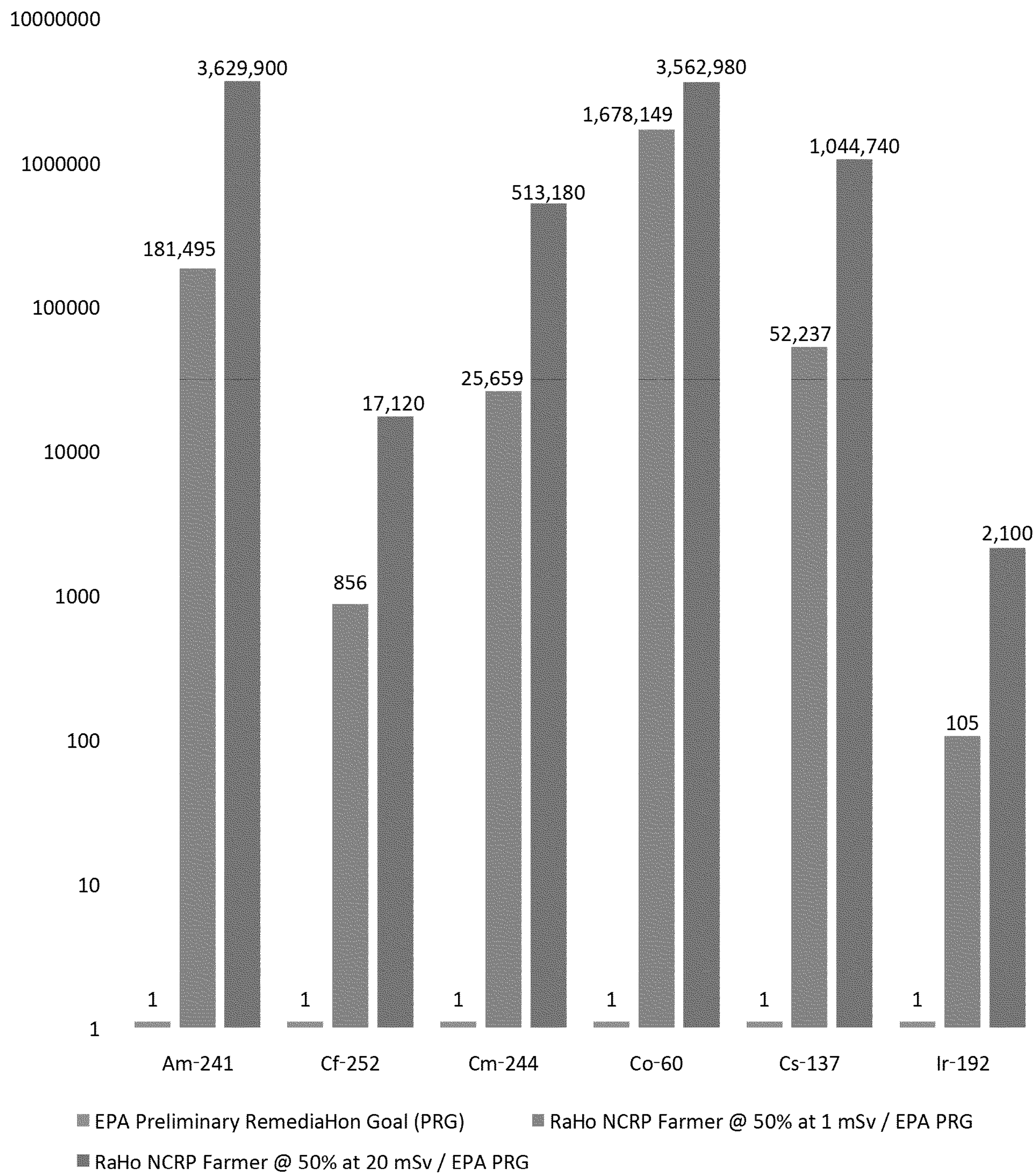


FIGURE 2b

How Many Times More Radioac2vity Would be Permi : ed in Soil for Farmers Under NCRP Proposal Compared to EPA's Remedia2on Goals

(@ 50% Confidence Level)

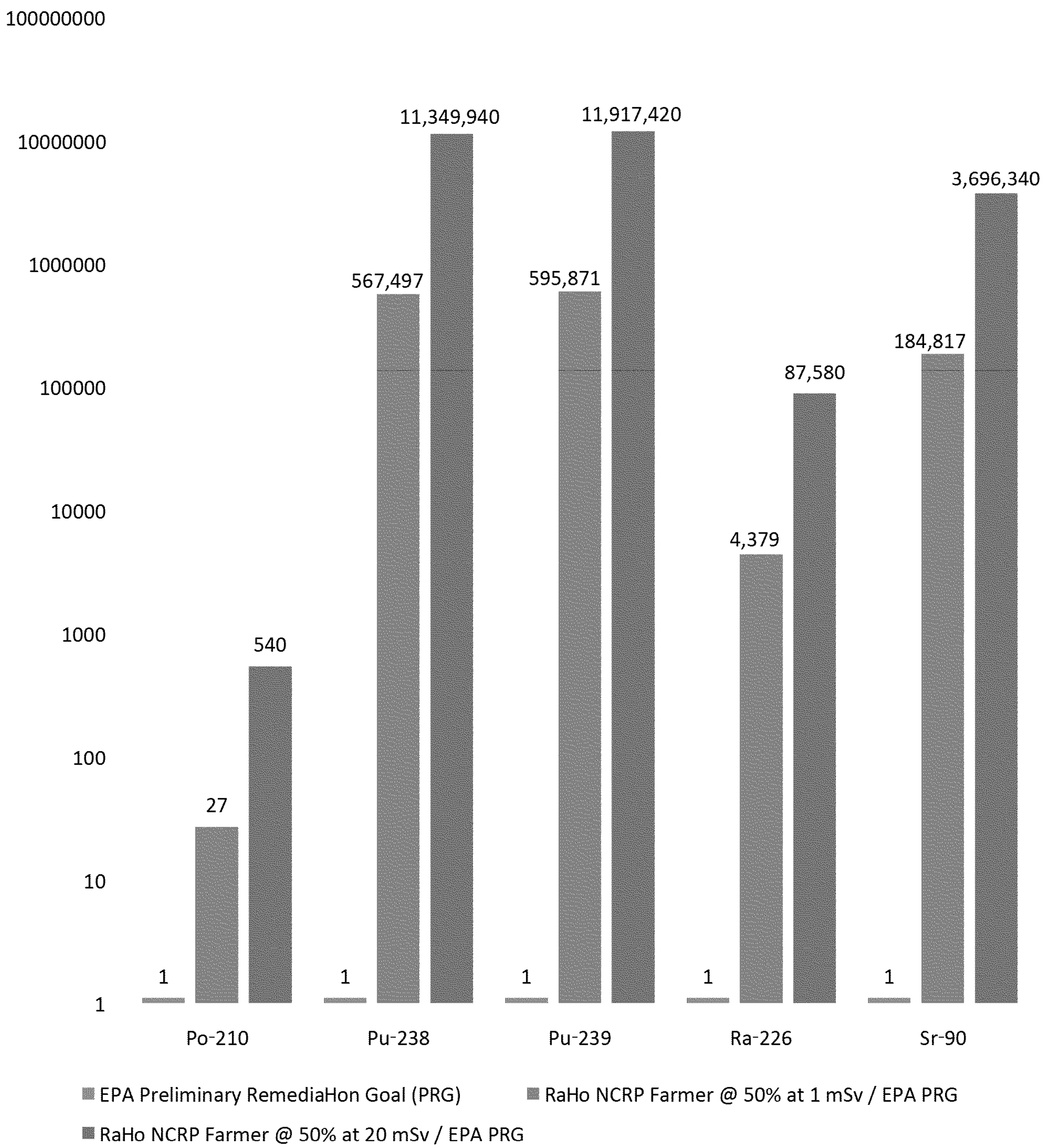


FIGURE 3a

How Many Times More Radioac2vity Would be Permi : ed in Soil for Urban Residents Under NCRP Proposal Compared to EPA's Remedia2on Goals

(@ 95% Confidence Level)

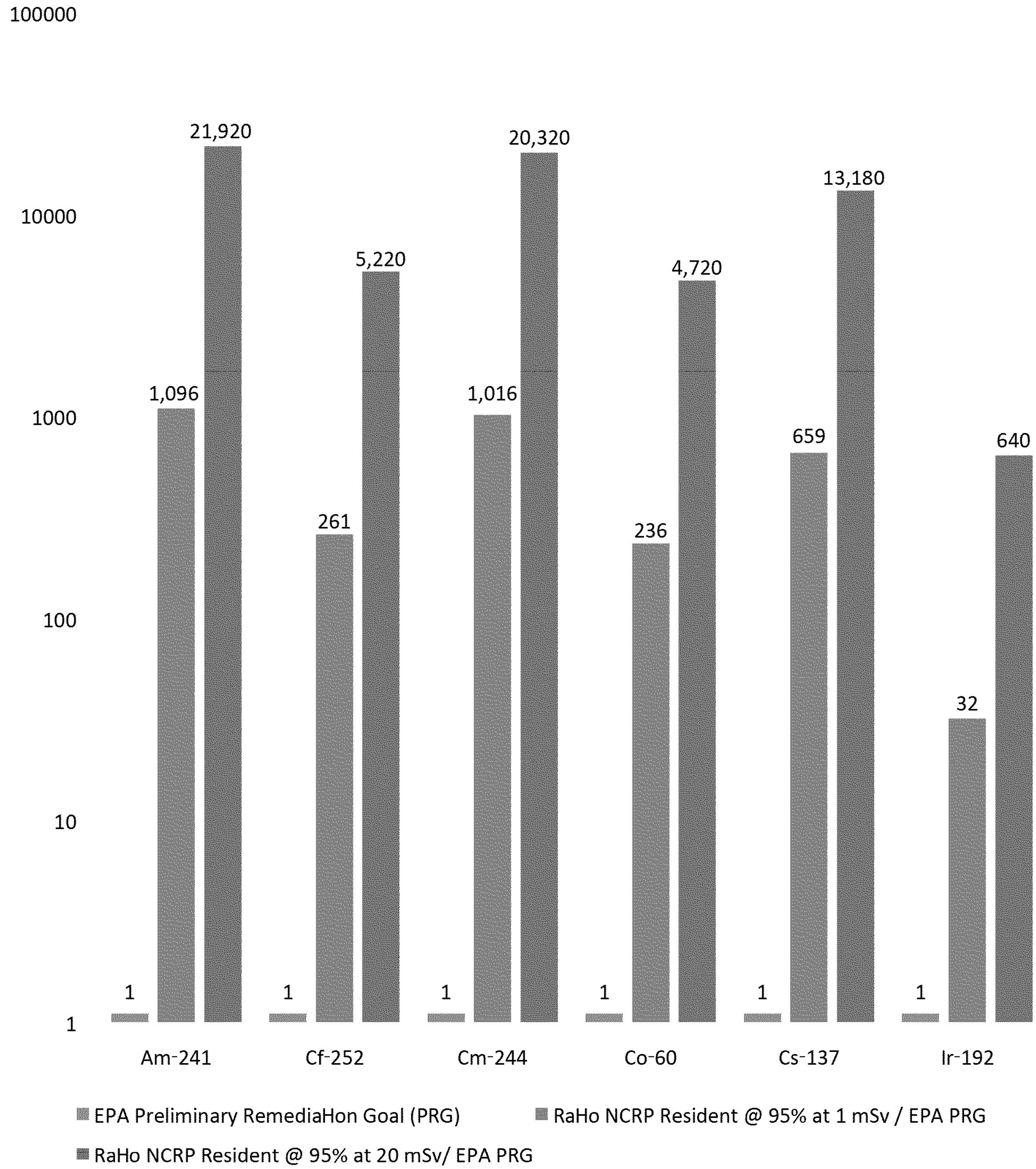


FIGURE 3b

How Many Times More Radioac2vity Would be Permi : ed in Soil for Urban Residents Under NCRP Proposal Compared to EPA's Remedia2on Goals

(@ 95% Confidence Level)

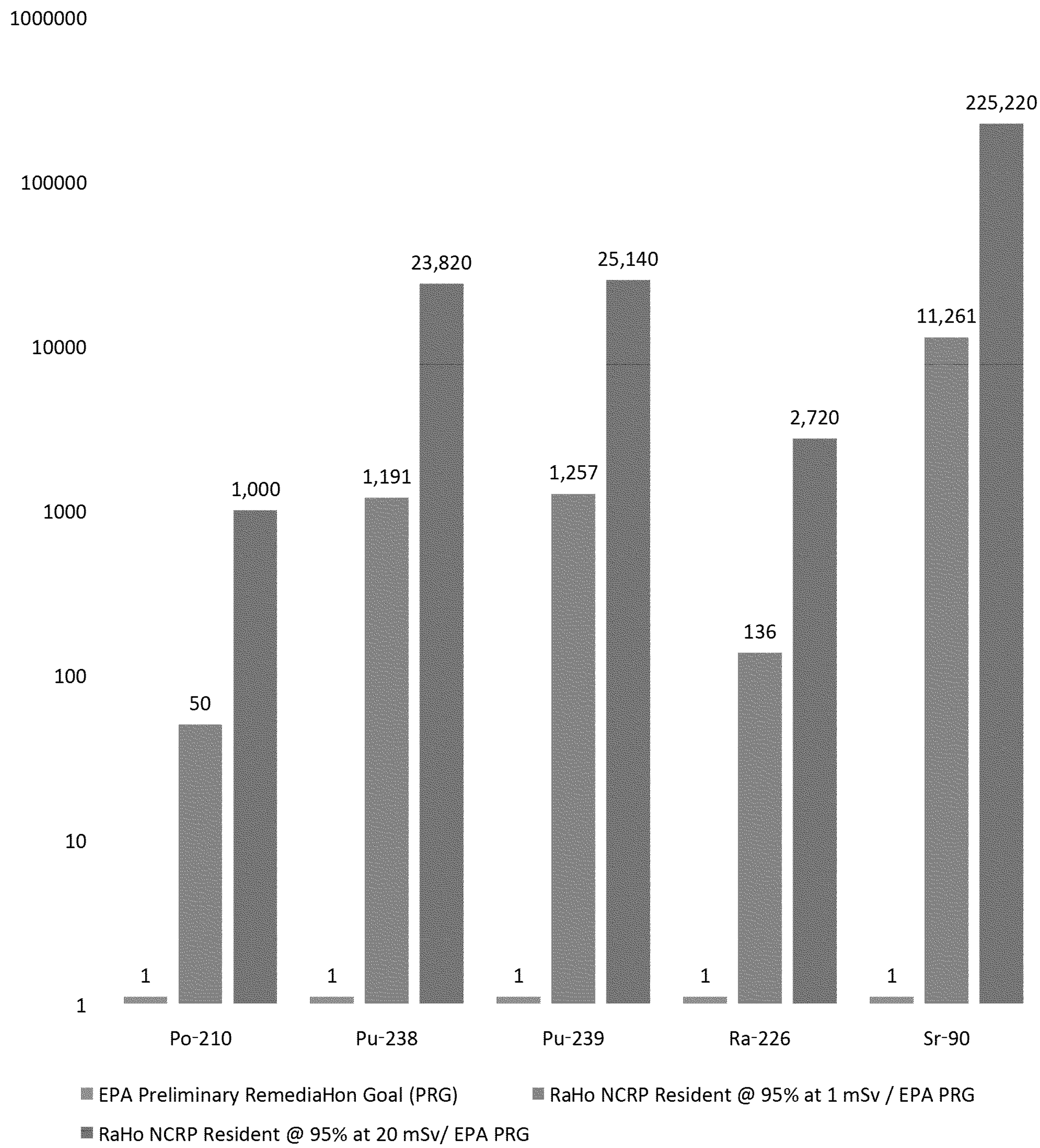


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FIGURE 4a

How Many Times More Radioac2vity Would be Permi : ed in Soil for Urban Residents Under NCRP Proposal Compared to EPA's Remedia2on Goals

(@ 50% Confidence Level)

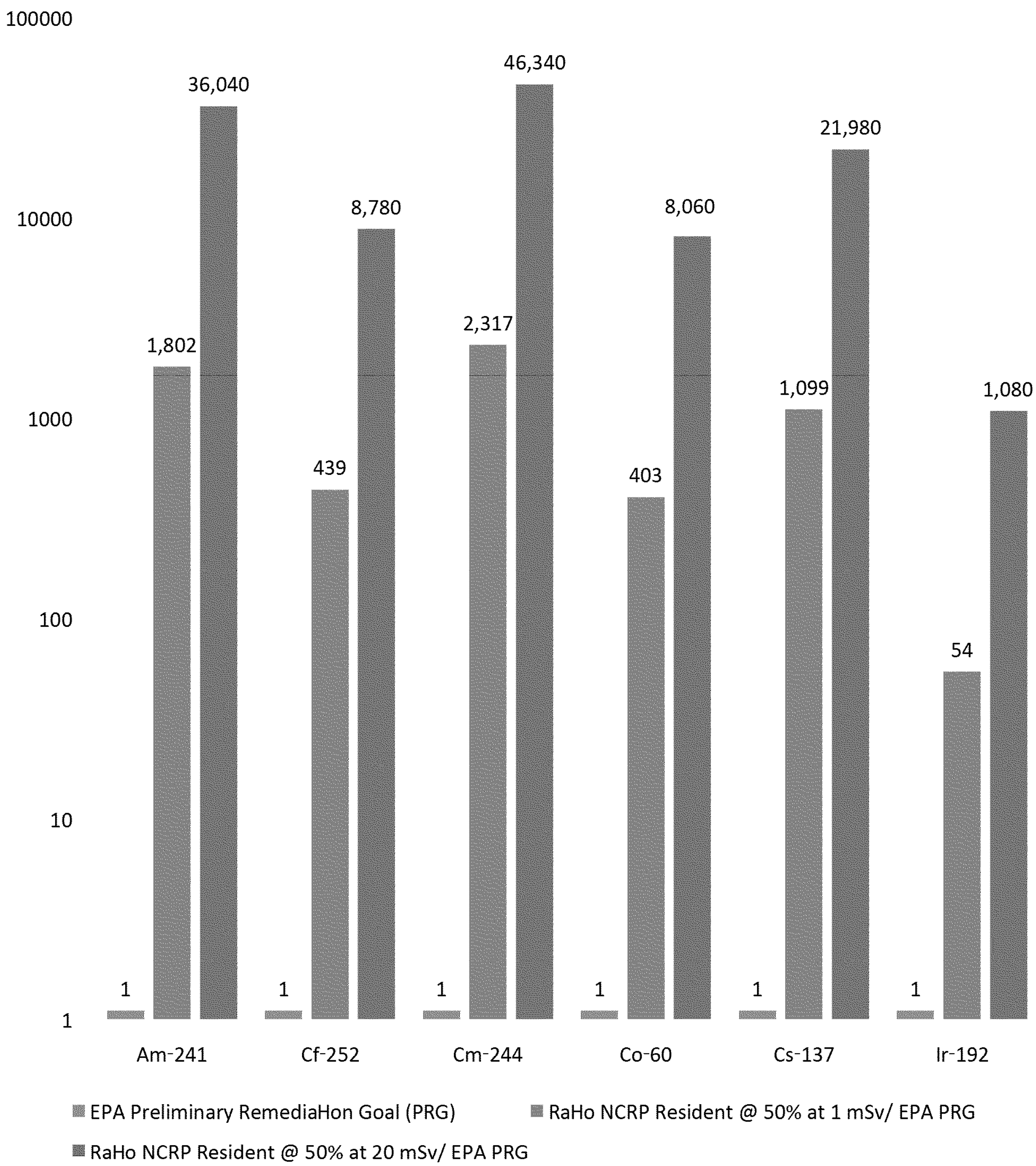


FIGURE 4b

How Many Times More Radioac2vity Would be Permi : ed in Soil for Urban Residents Under NCRP Proposal Compared to EPA's Remedia2on Goals

(@ 50% Confidence Level)

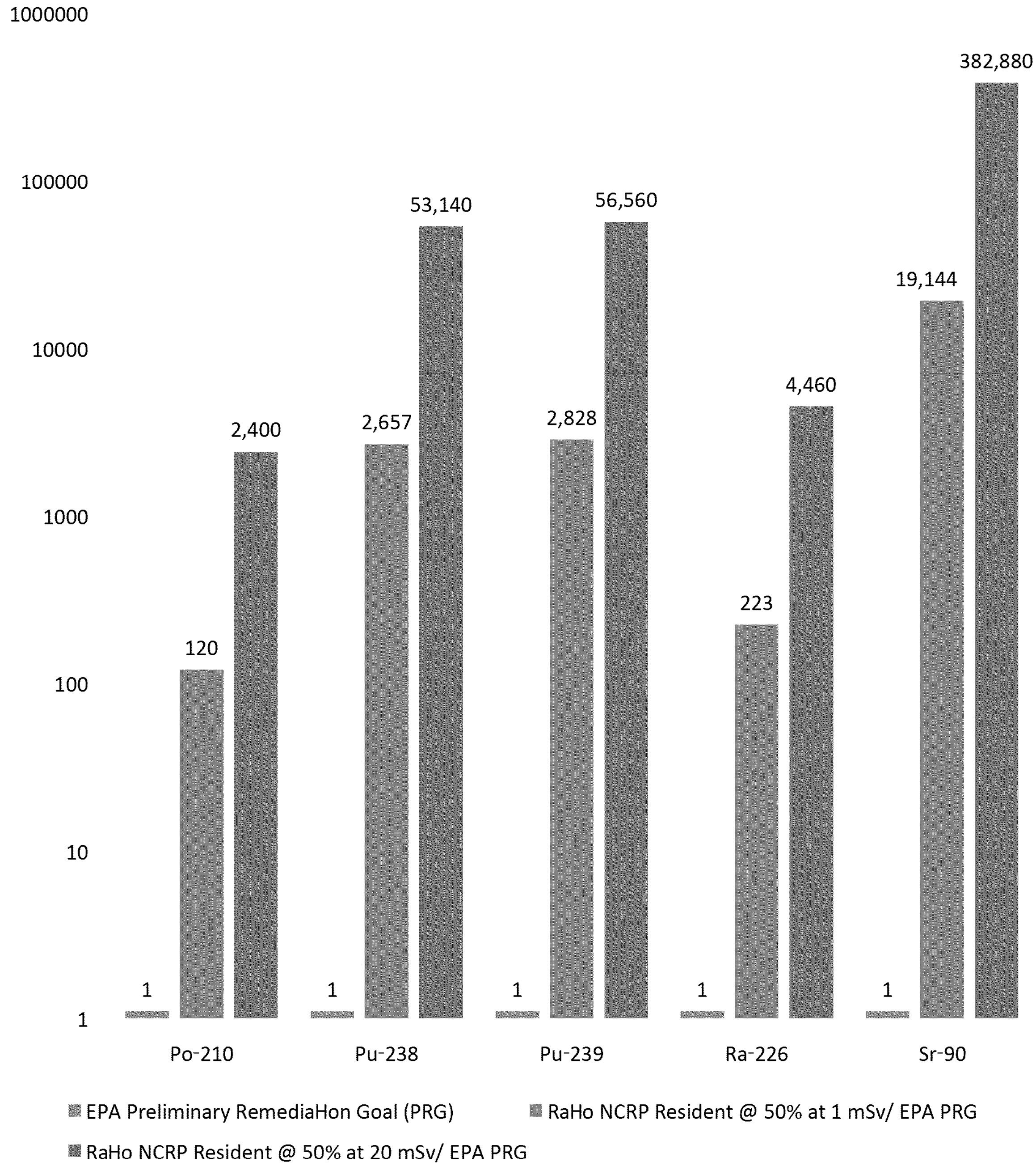
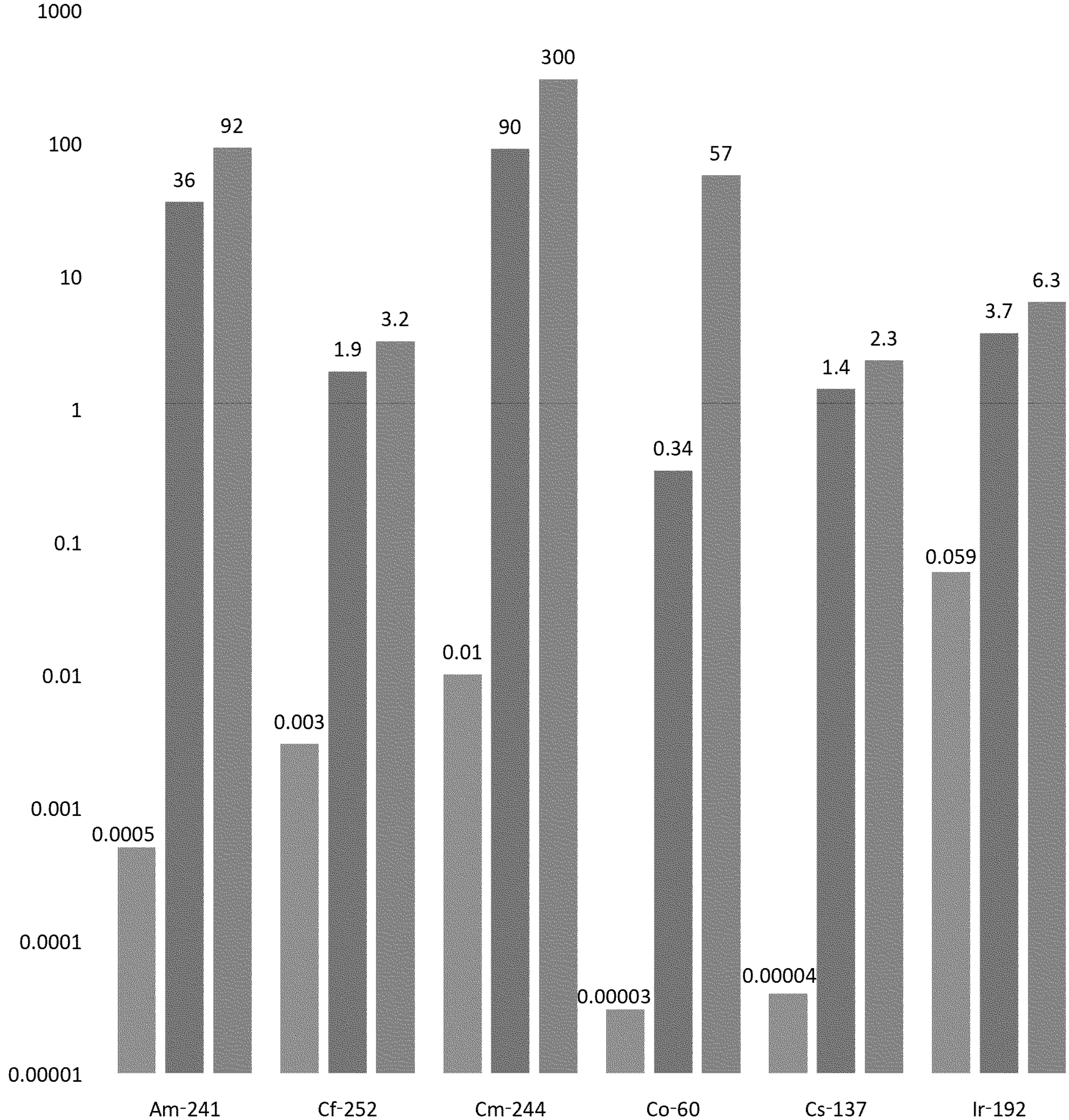


FIGURE 5a

Comparison of NCRP Proposed Permissible Concentra2ons of Radioac2vity in Farmer's Soil in Bq/g Compared to EPA Remedia2on Goals

(log scale)



EPA Farmer in Bq/g NCRP Farmer @ 95% in Bq/g at 1 mSv/ y NCRP Farmer 50% in Bq/g at 1 mSv/y

FIGURE 5b

Comparison of NCRP Proposed Permissible Concentra2ons of Radioac2vity in Farmer's Soil in Bq/g Compared to EPA Remedia2on Goals

(log scale)

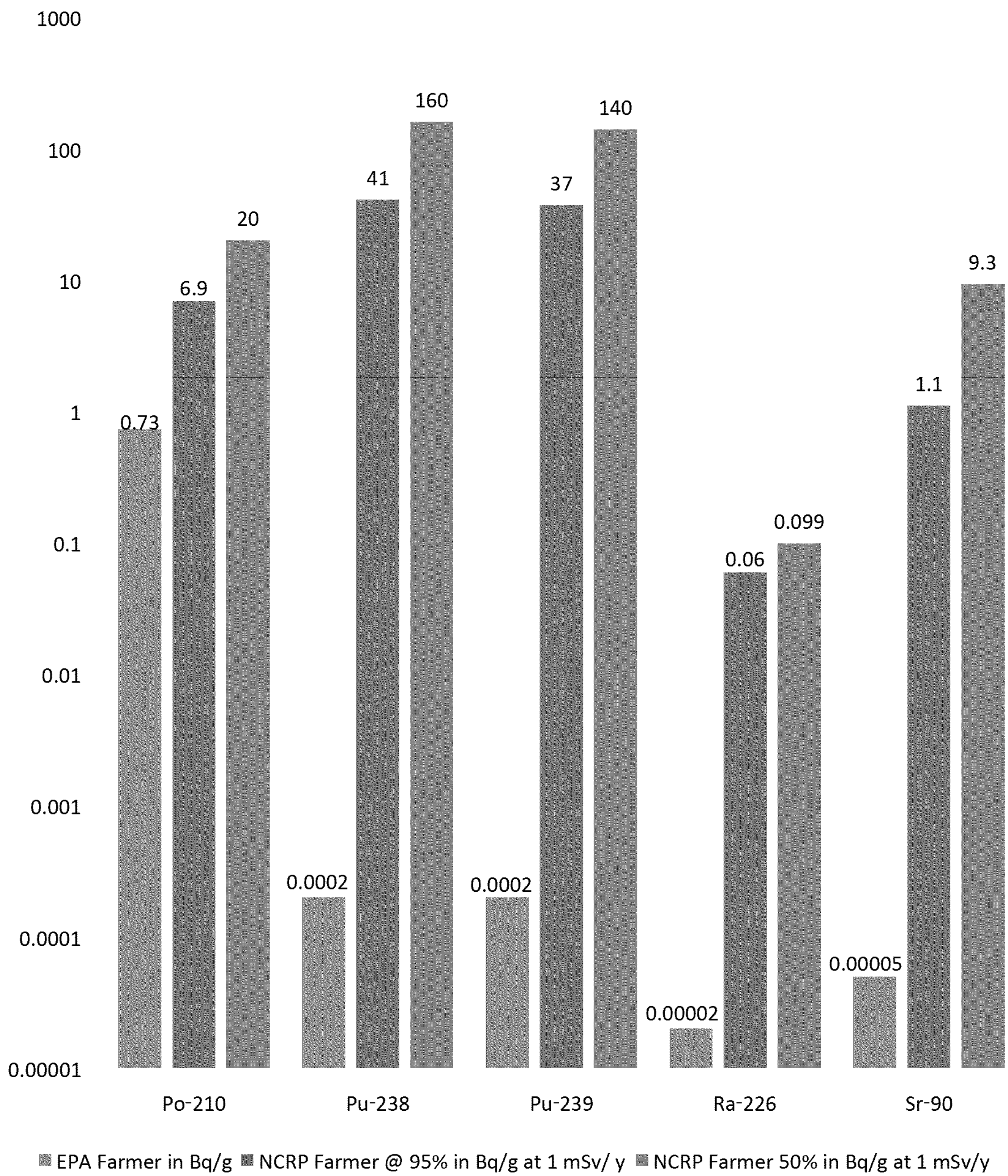


FIGURE 6a

Comparison of NCRP Proposed Permissible Concentra2ons of Radioac2vity in Resident's Soil in Bq/g Compared to EPA Remedia2on Goals

(log scale)

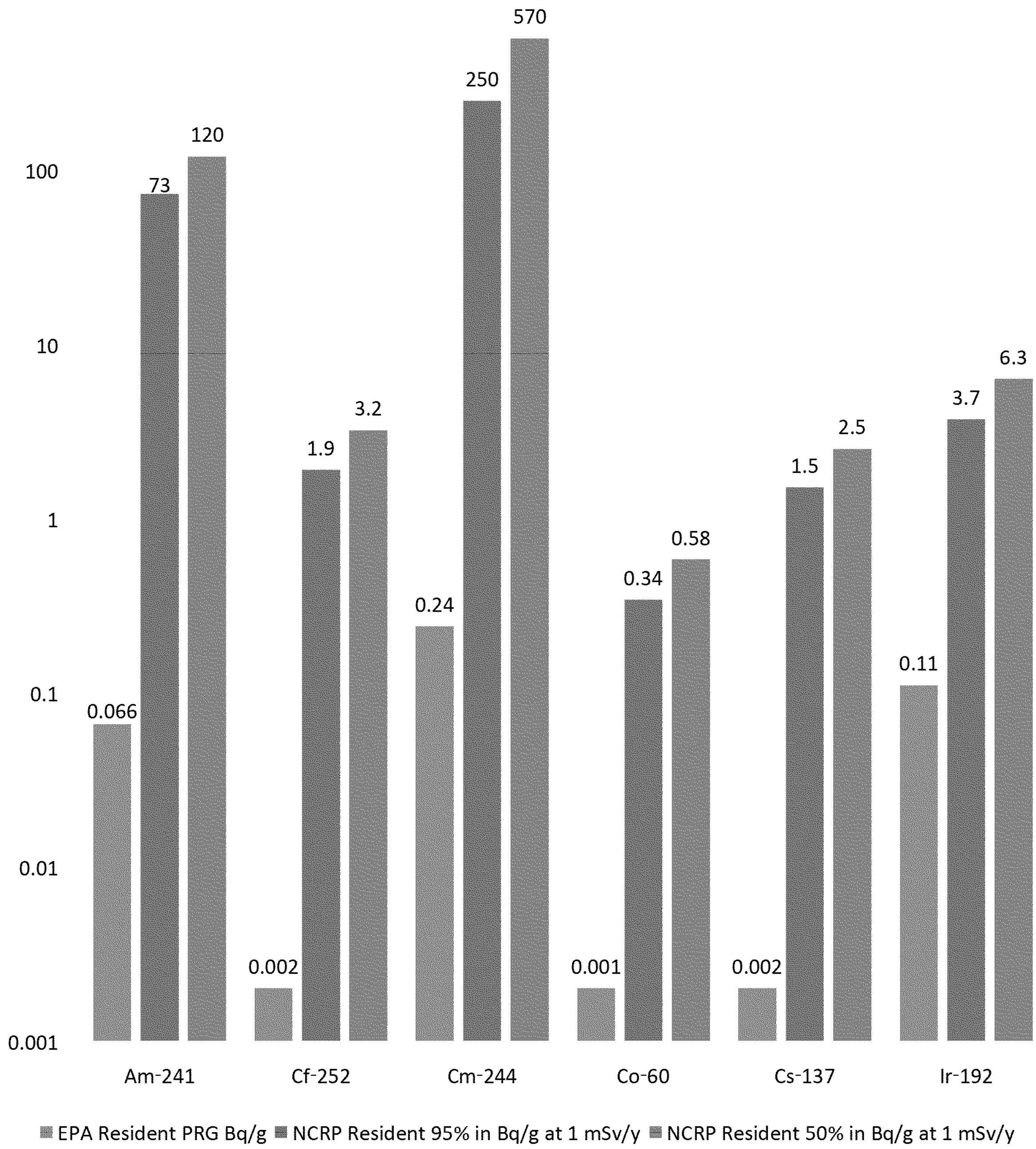
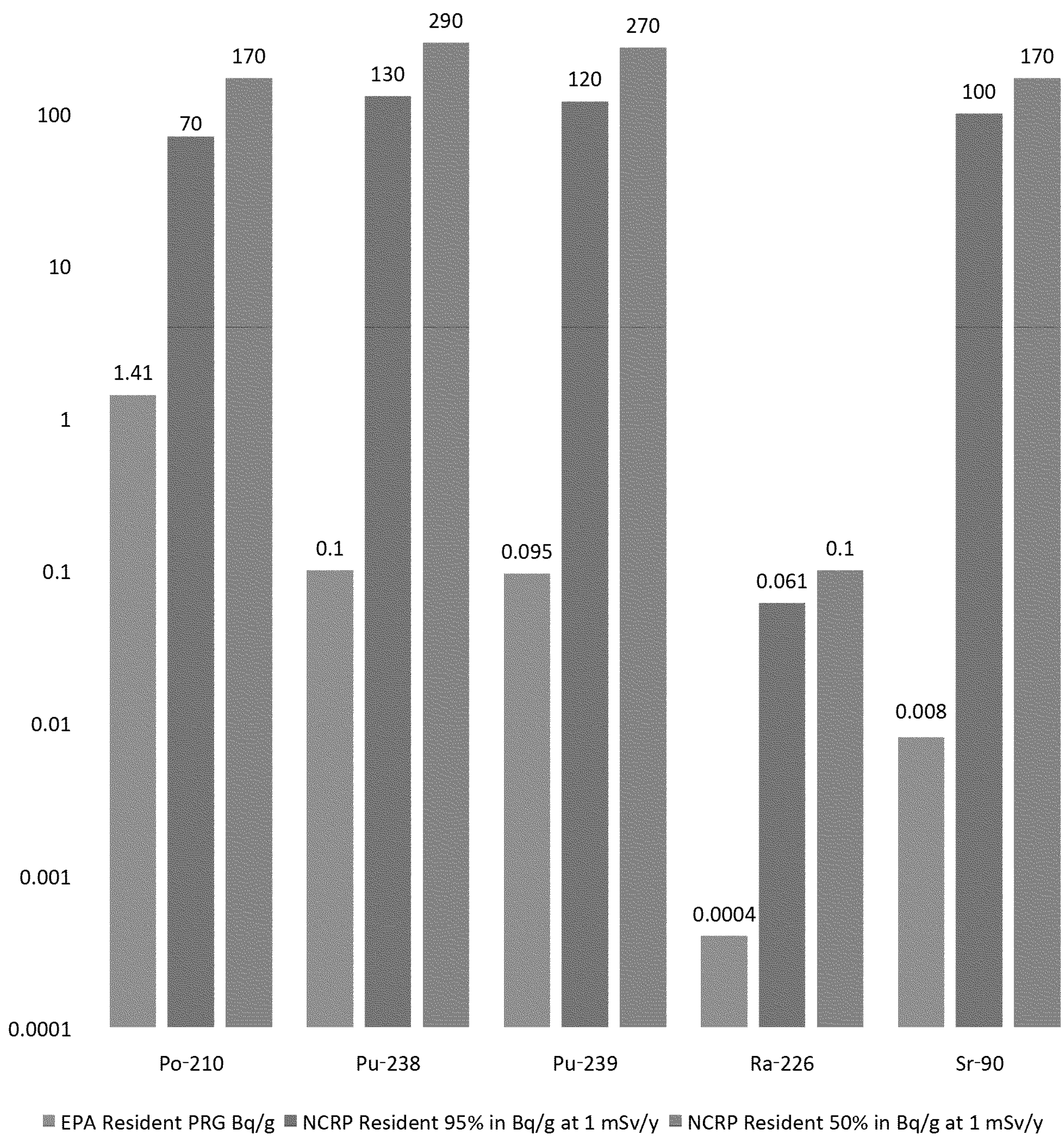


FIGURE 6b

Comparison of NCRP Proposed Permissible Concentra2ons of Radioac2vity in Resident's Soil in Bq/g Compared to EPA Remedia2on Goals

(log scale)



16 September 2013

EPA Draft PAG Manual Comments

Per the Federal Register announcement of 15 April 2013, and extended on 15 July 2013, the following comments are respectfully submitted:

1. <u>ICRP-60</u>

I fully concur with the EPA adoption of FRMAC calculation methodology, updated using ICRP-60 principles. This represents real progress, aligning the primary responding federal agencies for a radiological event to all share the same technical assumptions, based on the most up-to-date scientific consensus.

I also both hope and recommend technical outreach and training is extended to states, reflecting these changes, sharing this technical understanding and deepening state-federal coordination.

2. <u>What is a PAG?</u>

I would like to share my opinion that the next revision, or iteration, of the PAG manual would benefit from an expanded discussion of what a PAG is and is not.

On the first page of the Draft Manual, it states clearly that PAGs are not meant as "strict numeric criteria" and do not "represent the boundary between safe and unsafe conditions". Elsewhere in the Manual are references to "unavoidable dose". These distinctions are clear to those of us in a technical program area, and who have read EPA-400-R-92-001 multiple times.

These nuances are lost on most planners and decision makers, and represent a tremendous communication challenge to the general public. If an evacuation is ordered at a projected dose of 1 rem TEDE, a logical conclusion would be because there are health consequences making it unsafe. If I must relocate at a projected 2 rem dose in the 1st Year, and not at a projected 1.99 rem, it's hard to see this interpreted as other than a safe-unsafe line.

This represents one of the greatest risk communication challenges for a radiological incident, and how PAGs would be used. I would like to see the PAG Manual acknowledge and address this in greater depth. The use of PAG values is to drive the development of Protective Action Decisions. In this perspective, the public health benefits must inevitably be balanced and against the economic and societal impact costs, and other important factors. I would like to see the PAG Manual acknowledge and more fully discuss this in the future.

3. <u>Elimination of the Thyroid PAG</u>

One particularly interesting aspect of the Draft PAG Manual concerns the Thyroid PAG. Currently within the REP Program, a projected thyroid CDE dose of 5 rem would trigger evacuation or shelter-in-place recommendations. This has been changed in the 2013 PAG Manual (table 2-1, page 15) to instead trigger a recommendation only for the public to take KI.

Implementing this change on a state level presents two primary challenges. The first lies in messaging. If formerly 5 rem thyroid CDE would warrant an evacuation order, but not now, this implies a less protective standard. Can better technical understanding, which downgrades the health risks, explain this?

As actions change for specific numerical values, greater explanation is required; the PAG Manual needs to better address the technical basis for these changes. While the PAG Manual confers no legally binding requirements to prevent us from continuing to evacuate the general public at a projected 5 rem thyroid CDE dose, which is the most scientifically defensible course of action?

The second challenge is a very practical one. In our state all residents in the 10-mile EPZ annually receive a planning guide, which includes a voucher for a box of KI at an area pharmacy chain. While 100% of residents receive these vouchers each year, only 1-2% of these are ever redeemed. In our current messaging, the KI recommendation is always embedded (e.g., evacuate and take KI, shelter and take KI). Issuing a separate "take KI" only message would be impractical. Essentially we would be telling people to take something they had a chance to get, most likely didn't, and now can't get.

I do not dispute eliminating the thyroid or skin PAGs but greater discussion of the technical bases, explaining these changes, is needed.

4. Elimination of the 50-Year Relocation PAG

I fully support the elimination of the 5 rem 50-year Relocation PAG. Averaging 100 millirem per year, this easily falls within the variance of annual background doses within the United States, and does not represent a radiological health risk.

This is an example where a very minimal dose would trigger economic and societal impacts out of proportion to any benefit. Eliminating this is an excellent decision.

5. Emergency Worker Dose Levels

On page 26 of the Draft PAG Manual, it states the following:

"Emergency responders undertaking mission covered under the response worker guidelines should be informed when radiation control measures may not prevent doses from exceeding the 5 rem (50 mSv), general occupational exposure guidelines and should be made fully aware of the sub-chronic and chronic risks involved, including numerical estimates of the risk of delayed health effects."

Interestingly, page 2-11 in EPA-400-R-92-001 states:

"However, persons undertaking any emergency operation in which the dose will exceed 25 rem to the whole body should do so with full awareness of the risks involved, including the numerical levels of dose at which acute effects of radiation will be incurred and numerical estimates of the risk of delayed effects."

So in the 1992 PAG Manual, responders potentially receiving more than a 25 rem dose had to receive numerical estimates of chronic and non-chronic risks, whereas in the 2013 draft any worker potentially receiving more than 5 rem must receive the same. Why?

This is particularly interesting when, in the 2nd paragraph of page 27 in the Draft PAG Manual, it states that the estimated fatal cancer risk for workers exposed to 10 rem is slightly less than the general population risk.

The Draft PAG Manual does a good job in presenting acute risks in Table 2-3 on page 27. What it needs to present more clearly with an accompanying chart are numerical cancer risk estimates at 5 rem, 10 rem, 25 rem, and above. If these are the response worker guidelines (Table 2-2 on page 26), what are the numerical risks to communicate to responders?

EPA-400-R-92-001 provides such a chart for a 25 rem TEDE dose in Table 2.4 on page 2-12. This is discussed further in the Appendix C in the 1992 PAG Manual, but is missing from the 2013 version. Updated information regarding the statistical risks for delayed health effects at different dose levels should be incorporated into the 2013 PAG Manual.

Ultimately these are not simple issues: the biological effects of low doses, and whether the linear no-threshold model applies. Still, if responders need to be briefed of health risks at doses below 25 rem, this is information and discussion the PAG Manual should provide.

6. Sheltering-in-Place

The Draft PAG Manual would benefit from a more in-depth discussion of the dose reduction factors provided by sheltering. Currently this is only represented in Figure 2-1 on page 19, through a picture from the IND guidance document showing exposure reduction from nuclear fallout.

For example, what dose reduction does sheltering offer for a nuclear plant accident scenario? What sheltering conditions exist for a RDD scenario (e.g., if building ventilation systems aren't promptly shut down, airborne concentrations inside buildings could become greater than outside)? A bulleted point on page 33 of the 2013 PAG Manual reads "sheltering-in-place should be preferred to evacuation whenever it provides equal or greater protection". What guidance exists to evaluate this decision in terms of dose?

Sheltering is an important and viable protective action for a radiological incident. Greater guidance should be developed to provide shelter dose reduction estimates for planners and assessors. Guidance on the most effective sheltering practices would also be on benefit to the general public, incorporated into messaging and outreach. It seems there is an appropriate place for an expanded discussion of this in the PAG Manual.

7. Pregnancy

A notable difference in the Draft PAG Manual from EPA-400-R-92-001 is in how infrequently pregnancy is mentioned. The only mentions in the draft manual are on pages 19-20, in reference to KI.

This is quite different from the 1992 PAG Manual. While it is clear there is no separate PAG for pregnant women (C-20), multiple times it raises considerations regarding pregnancy, relocation, and decontamination prioritization (4-3, 4-6, 7-6, 7-17). The 1992 version also advises that the assignment of emergency worker missions "should be limited to nonpregnant adults" (page 2-10).

On page B-18, the 1992 PAG Manual presents the IC-77 recommendation controlling exposure of the fetus to less than 0.5 rem in the first two months. Page E-11 continues along this line of thinking, stating "women who are less than seven months pregnant may wish to relocate for the balance of their pregnancy if the projected dose during pregnancy cannot be reduced below 0.5 rem". The 2013 Draft PAG Manual has sections on dose projection and establishing isodose-rate lines in its relocation section, but no mention of these pregnancy public health concerns.

It is almost certain for any radiological incident that the general public will be very concerned, pregnant or lactating women among the most concerned. I am unclear why these considerations were dropped in the 2013 PAG Manual.

8. Protective Action Guidance for Food and Drinking Water

I recognize the difficulties in developing a drinking water PAG, or DIL, and support the development of a technical resolution for this issue.

I also applaud the inclusion of section 3.5.3, and the discussion of different corrective action options to reduce contamination in the drinking water supply. This is an interesting addition to the PAG Manual, and of legitimate preparedness concern.

I would welcome and expanded technical discussion of these topics in an appendix to the PAG Manual.

9. Guidance for the Late Phase

I also commend the expanded discussion of Late Phase issues in Chapter 4 of the draft PAG Manual. As stated in the key points found at the end of this chapter (page 69), "safely managing and disposing of radioactive waste will require pre-planning at all levels of government and careful coordination with stakeholders at all stages of the decision-making process." I am optimistic the inclusion of this section can serve to catalyze this pre-planning.

Recovery after a radiological incident is rightfully described in the PAG Manual as a flexible and iterative process. That said, this section avoids any mention of remediation dose levels. Late Phase decision making must address cost, public perception, and public health. Some numerical clean-up guidelines should exist for state and local stakeholders, targeting and helping to project budgets for remediation goals. There is just not the expertise at the state and local level to determine the public health concerns in remediating down to 100 millirem/year, 200 millirem/year, or 499 millirem/year. EPA-400-R-92-001, in Appendices C and E, had several sections identifying cost assumptions and cost/risk considerations. This would be very relevant to update and include in the Late Phase section of the current PAG Manual.

The discussion of waste disposal options, a new inclusion, is also highly appropriate and relevant. In future versions, I would also like to see some discussion of remediation strategies for agricultural land.

This entire Late Phase section could also be discussed in greater technical depth as an appendix to the PAG manual, particularly as costs, impacts, and lessons learned are identified following events in Japan.

10. Overall Comments

EPA-400-R-92-001 was primarily a REP Program document, designed around source terms for a nuclear generating plant accident. The newer PAG Manual attempts to be applicable to a wider range of radiological scenarios. This is laudable.

While this is an excellent effort, one criticism is this recent iteration of the PAG Manual is shorter and far less technical than EPA-400-R-92-001. Like many, I learned a great deal reading the 1992 PAG Manual, and appreciated its numerous documented technical references, representing the best scientific understanding regarding radiation, risk, and dose. I would like to see the PAG Manual in the future recapture this technical perspective.

These comments are submitted in the interest of greater collaboration and state-federal partnership. It is my sincere hope they are helpful in developing a better document, more effectively protecting the public, and building our overall national resilience.

Sincerely,

Brennen Brunner
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Robert Moser, MD, Secretary

Department of Health & Environment

Sam Brownback, Governor

September 16, 2013

Air and Radiation Docket and Information Center
Environmental Protection Agency
Mail Code 6102 T
Pennsylvania Ave
NW Washington DC, 20460
Attn: Docket ID No EPA-HQ-OAR2007-0268

The Kansas Radiation Control Program has performed a review of the 2013 draft of the "PAG Manual: Protective Action Guides and Planning Guidance for Radiological Incidents". The Kansas Radiation Control Program believes the efforts of the EPA to revise the current PAG Manual are a positive step. To the extent possible, we have attempted to provide comments on the specific issues that were requested in Section E of the Federal Register Notice. However, we have some generic comments that apply to the entire document that we feel should be addressed before this new manual is considered final.

The title of the PAG Manual is "Protective Action Guides and Planning Guidance for Radiological Incidents". The first three chapters are clearly focused on the basis for the PAGS, the numerical values to compare projected doses to, and the actions that should occur. The fourth chapter focuses more on planning guidance and does not include much in the way of PAGs. Therefore, we feel that the title of the fourth chapter should be changed to "Planning Considerations for the Late Phase" instead of "Guidance for the Late Phase".

We feel that referencing the 1992 version of the PAG manual is detrimental to the purpose of the new manual and could lead to confusion. When the new version of the manual becomes final, it should completely replace the old version. Sections of the old PAG manual that are still applicable should be contained in the new PAG manual. In addition we feel that some of the references have not been updated that should be. An example of this is the reference to the Reactor Safety Study in section 2.4.2. This section should be updated to reference current understanding of reactor accidents as discussed in NUREG-1935, the SOARCA Report.
On a final note we would like to see the new EPA PAGs adopted eventually as Presidential Guidance. As this will take additional time we also recommend that the new EPA PAGs are not held up while this Presidential Guidance is sought.

Thank you for considering these comments and requests. Kansas stands ready to assist our Federal partners and are available to provide additional details on any of these issues should you desire. I look forward to your response.

Sincerely,

Thomas Conley, CHP
Chief, Radiation Control Program
Kansas Department of Health and Environment

ATTACHMENT 1

SPECIFIC COMMENTS SOUGHT BY EPA
Manual of Protective Action Guides

1. To implement the PAGs, the reader is referred to dose calculations in the Federal Radiological Monitoring and Assessment Center (FRMAC) Assessment Manuals. The Assessment Manuals are updated with current International Commission on Radiological Protection (ICRP) dosimetry models (i.e., ICRP 60 series) and dose coefficients. The FRPCC also encourages the use of computational tools such as DOE's Turbo FRMAC, RESRAD RDD and NRC's RASCAL or other appropriate tools and methods to implement the PAGs. We request comment on the usefulness of this approach and seek feedback on how to facilitate implementation of these methods in emergency management plans.

We understand why EPA has chosen to recommend the use of computational tools such as Turbo FRMAC and RASCAL to calculate values to be compared to the PAGs. While in basic agreement with this concept it should be made clear that there may be a slight difference in results depending on which model is used.

The 1992 Manual of Protective Action Guides and Protective Actions for Nuclear Incidents (EPA 400–R–92–001, May 1992) contained tables and charts that provided Dose Conversion Factors and Derived Response Levels for various radionuclides along with formulas for calculating these values. The FRMAC Assessment Manual and their Turbo FRMAC program for dose assessment do not use these terms in the same manner as the original document. The updated guidance should use terminology consistent with FRMAC, or refer to their methods and tools generically as "the most current DOE/FRMAC Assessment Tools". Further, the table and charts found in the 1992 version of the PAG Manual were useful for state assessment staff as a quick reference guide. Lacking these tables and charts, it would be useful to have a single repository for all the tools available for accident assessment for various radiological accidents. Currently, Turbo FRMAC is distributed and updated through distribution of CDs to licensed organizations. RESRAD RDD is available but (from my understanding) has issues running on some IT platforms that states use.

We suggest that EPA, in conjunction with the FRPCC, consider developing web access to radiological assessment tools and reference material so that the most current versions and updated documents and guidance are accessible in a "onestop" format. It would also be extremely beneficial for the assessment tools to be web based so that distribution and updates are no longer necessary. This would allow all states to access the most current version of tools, documents and guidance that are necessary for the assessment of all types of radiological accidents, i.e. NPP, RDD, IND. It would ensure the consistent application of assessment principles and would facilitate updating methods over time as changes are made to dose calculations models (i.e. RASCAL, TurboFRMAC), dosimetry models (i.e. ICRP guidance) and other documents that would affect the calculations for radiological dose.

2. The Agency recognizes a short-term emergency drinking water guide may be useful for public health protection in light of the Fukushima nuclear power plant accident, which impacted some Japanese drinking water supplies. Input on the appropriateness of, and possible values for, a drinking water PAG is being sought.

The Committee recommends that the final version of the PAG manual have guidance for drinking water. It is critical for situations where there are no reasonable alternative water supplies for the short term, the drinking water supply contains radioactive materials that would exceed Safe Drinking Water Standards, access to drinking water is crucial to public health, and relocation/evacuation is not feasible at that point in time. Part of this discussion should include the evaluation and consideration of the Department of Homeland Security Document, Planning Guidance for Protection and Recovery Following Radiological Dispersal Device and Improvised Nuclear Device Incidents. Interestingly, this document, issued in 2008, includes a PAG for water, Table-1, at 0.5 Rem (0.005 Sv) projected in the first year. The document states that "These values are consistent with those now used or being considered as PAGs for other types of nuclear/radiological incidents. Further, the DHS document states:

"By agreement with the Environmental Protection Agency (EPA), the Guidance being published today is final and its substance will be incorporated without change into the revision of the 1992 EPA Manual of Protective Actions Guides and Protective Actions for Nuclear Incidents (the PAG Manual). This notice of final guidance will therefore sunset upon publication of the new EPA PAG Manual (see, http://www.epa.gov/radiation/rert/pags.html). The reader will then be directed to the new EPA PAG Manual, where these provisions may be found."

It is unclear where the updated PAG guidance brings us regarding the PAG for Drinking Water. The guidance was not adopted as written (as stated in the DHS document) and the DHS guidance has sunset according to the language cited above. This leaves no recognized basis for establishing a drinking water intervention level other than those in the Safe Drinking Water Act. We do not believe that these threshold values are practical for application during significant radiological emergencies where there is widespread contamination of the drinking water supply. The 4 mRem threshold used for drinking water standards is based on multiple assumptions that include a 70-year committed dose from consumption. This is not a reasonable assumption for application during an emergency.

The EPA has provided a number of alternatives for drinking water supplies during emergency conditions that provide a means for reducing and/or avoiding dose. Recommendations should be made to consider these options and their feasibility for implementation prior to consideration of intervention levels for drinking water above the safe drinking water standards. However, if the public health risk of not having a water supply is greater than the risk of the dose received from drinking slightly contaminated water, then alternative drinking water intervention levels should be established for the short term until an acceptable water supply can be made available.

The parameters for this decision and the intervention level should be based upon the current guidance that FDA provides for food and milk combined with those established by DHS for IND/RDD events. For the Intermediate Phase, we suggest that water be included in the dose consideration for the ingestion pathway as a single value of 500 mRem per year (provided that alternative water supplies are not available or feasible). That should be the upper bound of exposure from the ingestion of food, water and milk combined. Water should not be treated as a separate exposure pathway since water is a key component of diet in many ways and cannot actually be separated. During this period, the supplier shall attempt to locate and supply water that will be in compliance with the Drinking Water Standards. Water used for the production of food stuffs shall result in food levels not exceeding the FDA DILs.

It should also be noted that any intervention level set is for interim use only, and every reasonable and feasible action should be taken to ensure that drinking water supplies for the public are brought back to an acceptablelevel or "normalcy" as soon as reasonably achievable.

3. The most substantive PAG change in the Early Phase is the 2001 guidance from the FDA that lowers the threshold for administration of potassium iodide (KI) to the public from 25 rem projected adult thyroid dose to 5 rem projected child thyroid dose. Chapter 2 includes a streamlined implementation scheme based on FDA's guidance. Please comment on the usefulness of this simplified guidance in the text of Chapter 2.

Kansas has several comments about section 2.3.4.

The decision to stockpile and distribute Potassium Iodide (KI) to the general public during a nuclear emergency is a state and local government decision. There are some states that stockpile and pre-distribute, others that stockpile and distribute through Reception Centers and others that choose not to stockpile at all. The FDA provides guidance that discusses in detail the intervention thresholds and dosages for each specific age group. In this sense, the prophylactic use of KI is not a public Protective Action per se but a supplemental action that state and local decision makers use according to the plans and procedures in place.

The new EPA PAG Manual has not only referenced the 2001 FDA guidance on KI but also reproduced certain sections of the document. We understand the need to simplify the guidance for issuing KI but it is important to not leave out the dosing information for KI that was contained in the 2001 FDA guidance. It is recommended that the PAG Manual be simplified by referencing the 2001 FDA recommendations for KI and omit the proposed excerpts from the guidance. Additionally, some states do NOT recommend KI to the public. Therefore, we agree with listing KI as a supplemental protective action.

4. The skin and thyroid evacuation thresholds were removed to avoid confusion with the KI threshold. The skin and thyroid doses were 5 and 50 times higher, respectively, than the 1 to 5 rem whole-body dose guideline. Please comment specifically on the appropriateness of not retaining the skin and thyroid evacuation thresholds.

Some states wish to continue to use a Thyroid PAG as they do not currently issue KI to the public. Therefore we recommend including language in the document that states may continue to use a Thyroid PAG for evacuation or shelter if they wish to add this additional PAG to ensure the public health and safety is protected in all possible scenarios.

5. The most substantive PAG change in the Intermediate Phase is the removal of the 5 rem over 50 years relocation PAG which was potentially being confused with long term cleanup. Please comment on the appropriateness of this change.

We feel that the removal of the long term PAG of 5 Rem is appropriate. Consideration out to 50 years should be part of the late phase/clean up criteria, not part of an intermediate phase PAG.

6. **As an extension of the PAGs, new guidance on reentry to relocation areas is provided to inform plans and procedures to protect workers and members of the public as the Intermediate Phase progresses. Please comment on the format and utility of this material**.

We feel that additional guidance on reentry is beneficial. However, the current format and content could be enhanced. The current guidance should include not only total dose that the individual should not exceed, but also provide guidelines on exposure rates, site specific conditions, and environmental conditions that should be considered before authorizing permission for reentry.

7. **Please comment on whether it would be useful to develop a new, combined Intermediate Phase PAG considering all exposure pathways to potentially simplify decision making**.

We agree with keeping the relocation PAG separate from the food PAG because the required actions to implement are so different (moving people vs. embargoing food products). However, as noted earlier, we believe that it would be beneficial to include drinking water in the estimation of ingestion pathway food and milk PAGs not to exceed a 500 mRem dose in the first year.

8. A brief planning guidance on the cleanup process is included. Please comment on the usefulness of this information, as well as how it might best be implemented in state, tribal and local plans.

This material might be better suited for an appendix. By making the guidance more of a checklist format it may also be more useful.

9. **A suggested process and organization for approaching the late phase cleanup is provided from the 2008 RDD-IND Planning Guidance. Please comment on the merging of that guidance with the 2013 PAG Manual**.

We feel strongly that the new EPA PAG Manual needs more definitive guidance for State planners on how to implement the cleanup process. The material presented in Chapter 4 of this document and the DHS RDD-IND Planning guidance provides a "theoretical" approach to a systematic process for evaluation of long term impacts, what considerations need to be made and what stakeholders need to be involved in the process. All this information is useful for setting up the process. However, as a technical document, the EPA PAG Manual provides no guidance, references or tools to perform the technical assessment of key parameters required for decision making. That is, there is no actual guidance for the practical implementation of the process. For example, there is no method or tool identified to evaluate comparative risk for various clean-up standards. Is there a tool to assist with evaluating the risk between a 100mRem, a 50mRem, and a 25 mRem clean up standard? There is no tool or method identified in the document to assist with the evaluation of the amount of waste generated from different clean up options. Using the above example, it is imperative that decision makers understand how choosing a lower clean-up threshold affects waste generation and disposal costs. Is there a tool or method that can be used to estimate these values?

A suggestion would be to provide a toolkit, guidance or references which would provide a means to calculate parameters such as cost and volume of waste based on cleanup standards. One of the problems associated with the optimization process is that for large incidents there could be adjacent geopolitical areas that have established different clean-up standards. This will lead to confusion and possible litigation. It is imperative that there be some standards established ahead of time that states can reference in order to promote consistency in the process for decision making.

10. Basic planning guidance on approaching radioactive waste disposal is included. Please comment on this material and how it should be implemented in emergency response and recovery plans at all levels of government.

It is inappropriate for the guidance to state that the consideration and disposal of waste generated through cleanup efforts following a significant radiological event is a state and local decision and consideration. Based on the data made available from the Fukushima accident and considering the available waste storage capacity in the United States, it is unreasonable to think that state and local government agencies would be able to address this significant issue without assistance from the federal government.

Further, nuclear power plants are licensed by the NRC and states have little to no regulatory authority over radioactive materials, reactor fuel and spent fuel. Long term storage and disposal of high level radioactive waste from fixed nuclear facilities is the responsibility of the DOE. Weapons material and waste is a responsibility of the DoD and therefore, any contaminated waste generated by the use of an IND ought to be the property and responsibility of the DoD. Material and waste generated as part of a terrorist act may be considered evidence subject to control by federal law enforcement agencies. In evaluating the regulatory agencies and authorities for radioactive materials, it is inconceivable how EPA can consider radioactive waste solely a state and local issue.

In the United States, there is a significant issue regarding long term radioactive waste storage and the construction of a suitable site for a high level radioactive waste repository. Further, current storage facilities that accept low level radioactive waste have severely limited capacity in light of the waste that would be generated by a large scale nuclear event. With these considerations in mind, it is unreasonable to think that state and local governments would be able to site, construct and license a radioactive waste storage facility within state borders in sufficient time to be effective for the response. For states with high population densities, it may very well be impossible to site such a facility at all. For large radiological events, it is likely that contamination will cross jurisdictional boundaries between states and perhaps even international borders. As one example, an Improvised Nuclear Device could be detonated by international terrorists and affect multiple states. The Kansas Radiation Control Program believes that the Federal Government bears the responsibility of protecting national security and as such bears the responsibility for waste disposal that would result from such acts.

A large release could lead to low level waste volumes that are impossible to store realistically. Standards need to be developed that ensure that the amount of low level waste generated can be accommodated at existing low level waste storage facilities. The states are not looking for theoretical solutions but practical and realistic solutions. The waste issue cannot be adequately addressed until cleanup criteria and disposal facilities are balanced. The EPA needs to have a more realistic approach to radiological waste disposal that identifies the resolution to the problem and establishes the challenge of radioactive waste disposal/management from a radiological disaster as a joint federal, state and local responsibility.

ATTACHMENT 2

ADDITIONAL COMMENTS FROM THE KANSAS RADIATION CONTROL PROGRAM
Manual of Protective Action Guides

Chapter 1

1. Table 1-1. Planning Guidance and Protective Action Guides for Radiological Incidents

The Early Phase of this Table lists the administration of prophylactic drug KI as a Protective Action Recommendation. The decision to stockpile and distribute KI to the public is a state and local decision and not all jurisdictions have decided to provide KI as part of their response. In order that the Administration of KI is not confused with other Protective Action Recommendations, it is recommended that it be considered a supplemental action for the public and not listed within this table. However, if the intent here is for the protection of emergency workers, it should be stated as such.

2. Page 9, 4th Paragraph

…(as in the case of an accident at an NPP)…

Changed to

…(as in the case of an accident at a NPP)…

3. Page 9, 4th Paragraph

The discussion of the late phase of an emergency introduces new terminology to the EPA document. The term "Reoccupancy" is introduced to describe what has been referred to in the past as "Return". If it is the intent of the EPA to introduce this term as the acceptable language for that action, it should be noted in **BOLD** and included in the glossary. It should also be noted within the text what term it will be replacing for clarity.

4. Page 9, Last Paragraph

The EPA is seeking input on the appropriateness of developing a short-term emergency water PAG. In Attachment 1 of this document, the we provided discussion regarding the development of a drinking water PAG. It would be appropriate to include that discussion here in the document and remove the final paragraph if the EPA accepts the suggestion.

5. Page 10, First Paragraph

The discussion within this relates to the National Primary Drinking Water Regulation. The regulatory standard of 4mRem/year based on lifetime exposure is provided. It would be of greater value to have the assumptions for the standard more clearly defined here so that decision makers can better understand the application of this standard. It should clearly state here or, if appropriate, in other sections related to drinking water exactly what time frames (70 years) consumption (liters per day), mitigation strategies (none) etc. are used to calculate that value.

6. Page 10, Final Paragraph

The discussion of the late phase includes the following statement:

"The cleanup process described in Chapter 4, however, does not rely on and does not affect any authority, including the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), 42 U.S.C. 9601 et seq. and the National Contingency Plan (NCP), 40 CFR Part 300."

The intent and interpretation of this statement is unclear. Should we assume that, if during the late phase, a state chooses a clean-up value that is greater than the CERCLA standards, that EPA would exercise its authority to block this action? The intent of this statement needs to be more clearly defined.

Chapter 2

1. Page 16, Section 2.3.1

Spelling question. There are two different spellings within the paragraph for the same word: colocate and collocate. EPA can decide what is best but for the meaning and intent of the discussion it is found, co-locate would likely be the best spelling.

2. Page 17, Section 2.3.2

While the general discussion provides good information, the NRC/FEMA released an updated version of NUREG-0654, Supplement 3 that provides certain specific scenarios for Nuclear Power Plants where shelter in place for close in populations, followed by evacuation once other populations are evacuated, affords a dose reduction. This is referred to as staged evacuation. It might be worth at least acknowledging this within this document for consistency.

3. Page 17, 6th Bullet

- If a major release of radioiodine or particulate materials occurs, inhalation dose may be a controlling criterion for protective actions

The EPA has made the decision to remove the Thyroid dose from consideration for evacuation with a reasonable explanation. However, if the EPA believes that thyroid dose from inhalation can still be a controlling factor for Protective Actions then it should remain. We recognize that the committed dose to the thyroid (organ) and the inhalation dose to the lung from inhalation are separate calculations. However, unless there is an explanation of how it can be controlling for one (lung) and not for another (organ) will be difficult to justify the elimination of the PAG for the thyroid.

4. Table 2-6, Page 31

Are the levels indicated in this table consistent with FEMA guidance for NPPs? Double check.

Chapter 3

1. Page 35, 2nd Paragraph

The concept of "Avoided Dose" is introduced here in the document. The concept of avoided dose is not well understood nor clearly discussed in any other federal guidance document. It would be beneficial to users of this manual to promote consistency in its application if there were a section within the document that discussed "avoided dose" and how that applies to decision making about PAGs. Terry Kraus (DOE) provided a good overview of the subject at the 2013 Annual Meeting of the Advisory Team. He can provide a good discussion of the topic if EPA believes that the discussion is appropriate for this document. We believe that it would be useful.

2. Page 38, 3rd Bullet, Section 3.3.2

- People who were previously evacuated, but reside outside the relocation area and may now return home. A gradual return is recommended.

Since the discussion of this Chapter is for the Intermediate Phase and is limited in scope to the assessment and actions for relocation and dose reduction, the bullet that discusses return or "reoccupancy" is probably inappropriate for this section. While there is agreement that the Intermediate and Late Phases will overlap, in certain circumstances quite considerably, return discussions should be limited to Late Phase actions. It is appropriate for decision makers during this phase to concentrate on protective actions that will further reduce public exposure from residual contamination, from ingestion of contaminated food, water and milk and dose reduction from mitigation strategies. Including return considerations in this section may refocus efforts away from assessment of public health impacts.

3. See Attachment 1 for discussion and comments on the development of Water PAGs

Chapter 4

1. See Attachment 1 for a more detailed discussion of Late Phase Actions and Clean-up standards.

2. The document fails to discuss the turnover process from DOE to EPA for environmental monitoring and assessment. For the late phase discussion in Chapter 4, it is unlikely that the ICS/NIMS structure will remain in place for extended periods of time as assets are no longer required and appropriate controls are in place. We believe that more consideration be given to what the structure for command, control and decision making will look like over time. While there may still be elements in place, there will likely be significant changes over time.

3. While there is a great deal of discussion regarding waste, this document needs to recognize that the responsibility for waste does not fall to state and local government agencies. This is an impossible task for the federal government to tackle for the long term storage of waste let alone the substantial quantities that will be generated following a large scale radiological incident. More consideration needs to be given to this section. At the very least it should clearly state that responsibility for radioactive waste following an incident will be shared among state and federal agencies.

Sara DeCair
Radiation Protection Division
Center for Radiological Emergency Management, Mail Code 6608J
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue NW.,
Washington, DC 20460

RE: Comments on DRAFT Protective Action Guidelines; Docket ID No. EPA-HQ-OAR-2007-0268

Dear Sara,

Attached please find my comments on the revised 2013 PAG Manual—Protective Action Guides and Planning Guidance for Radiological Incidents.

This is an impressive document that sets the foundation of our nation's radiological emergency response technical structure and the Environmental Protection Agency's continued stewardship of this doctrine is greatly appreciated.

My comments are confined to the following sections:

2.7. CONTAMINATION LIMITS AND MONITORING OF THE ENVIRONMENT AND POPULATIONS

2.8. SURFACE CONTAMINATION CONTROL

I am a Certified Health Physicist with over 20 years of experience in radiological emergency response. My comments are my own and do not represent the opinions of my employer, Lawrence Livermore National Laboratory, nor any of the organizations that I support.

Please do not hesitate to contact me if you have any questions,

Brooke Buddemeier
Brooke Robert Buddemeier
Certified Health Physicist
Brooke2@bigfoot.com

Comments on 2.7. CONTAMINATION LIMITS AND MONITORING OF THE ENVIRONMENT AND POPULATIONS

Although this section is only 4 paragraphs, it has several key statements that define terms that are not consistent with the rest of the document. The second paragraph reads:

> ***"People working in the parts of the restricted areas in which their dose from the residual radioactivity would exceed 2 mrem (20 µSv) in any hour or 100 mrem (1 mSv) in a year should operate under the controlled conditions established for occupational exposure."***

With this sentence, the PAG seems to have defined a "restricted area" as being above 2 mrem/hr or 100mrem/yr without a definition of the actions that must occur within this area to protect the public or responders. Restricted to whom? For what reason?

Given that the lowest actionable level defined in the early phase is the area where an exposure could lead to **1 rem in 4 days**, this boundary would make the best actionable demarcation. Otherwise you have defined a "restricted area" that contain people who have not been provided any protective action or guidance. Presuming a steady external dose rate, 1 rem in 4 days (96 hours) would be 10.41 mrem/hr. If we round this to 10 mrem/hr, this value would be consistent with the national and internal guidance below.

This boundary is consistent with the "Hot Zone" definition of NCRP and ASTM, however I realize that different organizations define this term in different ways and a more generic "controlled" zone may be appropriate.

Controlled Area Definitions (Note: 10 mrem/h = 0.1 mSv/h = 100 µSv/h)

Agency	Zone Name	Demarcation	Numerical Value
ASTM E2601-08	Hot Zone	Hot Line	Hot line: not to exceed 10 mR/h (0.1 mSv/h) when reasonably achievable.
IAEA Manual for First Responders to a Radiological Emergency	Inner cordoned area (Hot Zone)	Safety Perimeter	Ambient dose rate of 100 µSv/h measured at 1 m above ground level or from an object; boundary of inner cordoned area.
IAEA (2003) *Method for Developing Arrangements for Response to a Nuclear or Radiological Emergency*	Inner Cordoned Area Radius (Safe Distances)	N/A	- Ambient dose readings of 100 µSv/h - 1000 Bq/cm2 gamma/beta deposition - 100 Bq/cm2 alpha deposition
CRCPD RDD Handbook (2006)	Low Radiation Zone	N/A	< 10 – 100 mR/hr within a reasonable distance of the epicenter of the blast. If there is a *large* population to be evacuated in the *low* radiation zone (< 10 - 100 mR/hr), self-decontamination at home to the extent possible may be advised.
NCRP 138	The initial alarm level is significantly higher than natural background so that		The NCRP recommends that an ambient dose rate of approximately 0.1 mSv h^{-1} is a suitable initial alarm level.

	false positive indications are avoided.		(page 98)
NCRP Commentary #19	N/A	Outer Perimeter	• 10 mR/h exposure rate (~0.1 mGy/h air-kerma rate); • 60,000 dpm/cm^2 (1,000 Bq/cm^2) for beta/gamma surface contamination; and • 6,000 dpm/cm^2 (100 Bq/cm^2) for alpha surface contamination.
NCRP 165	Hot Zone	Outer Perimeter (As defined in NCRP Commentary No. 19)	Establish the hot zone boundary if any of the following are exceeded: • 10 mR/h exposure rate (~0.1 mGy/h air-kerma rate); • 60,000 dpm/cm^2 (1,000 Bq/cm^2) for beta/gamma surface contamination; and • 6,000 dpm/cm^2 (100 Bq/cm^2) for alpha surface contamination.
The Federal Planning Guidance for Response to a Nuclear Detonation	N/A	The 0.01 R/h boundary	The area at which radiation controls should be initiated by responders.

The section's last paragraph (below) is inaccurate for reasons I detail in the next section. Specifically, ***two times (2x) the existing background*** levels is not a valid measurement for release of an object.

> ***"A contaminated item should not be released to an unrestricted area. Based on incident and locality specific considerations, it may be acceptable to release contaminated materials if the level of surface contamination is less than two times (2x) the existing background levels. As an alternative to decontamination, contaminated items (i.e., not people or animals) may be retained in the restricted area while the radiological contamination decays."***

Recommended Resolution for Section 2.7 (changes underlined)

"People working in the parts of the hot zone [or controlled areas] in which their dose from the residual radioactivity would exceed 10 mrem (100 µSv) in any hour should operate under the controlled conditions established for occupational exposure."

"A contaminated item should not be released to an uncontrolled area. Based on incident and locality specific considerations, it may be acceptable to release contaminated materials if the level of surface contamination is below acceptable release criteria. As an alternative to decontamination, contaminated items (i.e., not people or animals) may be retained in the restricted area while the radiological contamination decays."

Comments on 2.8. SURFACE CONTAMINATION CONTROL

The contamination screening levels provided on pages 30-32 should be reconsidered for several reasons:

1) They are not protective of people and the environment. As written, this guidance could result in deterministic effects (e.g., acute exudative radiodermatitis) and unnecessary increased stochastic risk (e.g., skin cancer). Therefor this recommendation conflicts with the technical basis of the PAG manual.
2) The decontamination recommendations may cause more harm than benefit as the guideline to continue to attempt decontamination until below "2X Background" may result in physical harm and elevated internal uptake.
3) They are inconsistent with national and international guidelines
4) They are not scientifically derived since the concept of "2X Background" is a rule of thumb and not a measurement or traceable reference tied to a specific risk or health effect.

Although I applaud the authors for trying to find a simple solution applicable in the field, it is the purpose of this document to set technical, justified guidelines that balance the benefit of any action to the potential harm that it may cause. In this regard, the PAG should provide contamination monitoring recommendations based on the risk that contamination poses to the population, not "*derived primarily on the basis of easily measurable radiation levels using portable instruments.*"

The PAG's contamination monitoring guideline should be a defendable, discrete, measureable value expressed in terms of surface contamination (e.g. Bq/m^2) or spot contamination (Bq) that can be later converted to operational procedures that are specific to the instruments and the technique used by the responders. Examples of "operationalizing" technical guidance can be found in Appendix B, "How to Perform a Radiation Survey for Contamination: Instructions for Workers," of NCRP Report No. 166 and "Handbook for Responding to a Radiological Dispersal Device. First Responders Guide—The First 12 Hours (CRCPD, 2006)"

For population monitoring, the PAG referenced CDC's 2007 (Predecisional draft) document "Population Monitoring in Radiation Emergencies: A Guide for State and Local Public Health Planners," but failed to heed the recommendation of that document

> "The initial screening criteria must focus on preventing acute health effects and must take into account the magnitude of the incident and availability of resources. The specific operational criteria provided to first responders must match the types of instruments they will be using."

Appendix C of CDC Population Monitoring guide identifies the various national and international recommendations at the time of its writing. I have summarized these recommendations below and added more recent guidance documents.

Note that the term "Screening" (as opposed to formal monitoring) is not well defined. Especially by the 2013 EPA PAG Manual which used the screening term for a variety of activities in this section.

- Defining “early screening” as when “The stations should be set up to provide simple (rapid) decontamination if needed and to evaluate whether affected people should undergo more extensive decontamination or other special care” in areas up to 5mR/hr.
- Table 2-5 defines “Emergency Screening” as twice background in areas up to 1 mR/hr.
- Table 2-6 defines “Screening Levels for People and Objects” as twice background in areas up to 0.1 mR/h

Since “2X background” is essentially based on the radiation / contamination levels at the location that measurements are being made, this resulted in 3 different “screening” levels and descriptions.

Many national guidance documents list two different monitoring levels or techniques:

- A rapid assessment level, often termed **screening**, where action is warranted to prevent adverse effects and the quickly separate people that need more immediate decontamination. Screening is often performed before decontamination and is meant for high throughput of personnel.
- A more deliberate **monitoring** level, often for post decontamination or when the number of victims is small. This monitoring is performed to look for lower levels of contamination, often taking much longer to perform.

For the purpose of this commentary, I have used the definitions above to define the categories below.

Why the guidance is <u>not protective</u>:

Without specifying an instrument efficiency and survey technique (i.e., how close and how slow) a “measurement” of “twice background” could easily miss significant contamination levels on people and objects. This is true even on the measurements made in the low background areas.

The activity of “frisking” for contamination inherently involves getting close to the surface you are checking (often within a few inches) and moving slowly over the entire surface area (2 inches per second is often used as a rule of thumb, however this could result in a 20+ minute survey for an adult using a side or end window probe). Since this is not specified, users are not likely to perform an optimal frisk.

Even when performed optimally, a moving probe <u>cannot</u> detect contamination (spot or widespread) at the same efficiency as a stationary measurement. This is especially true in an elevated background. The FEMA study sited below found that even some Pancake GM instruments could not find 1.0 µCi spot contamination (which is enough to cause acute effects) when operating in a 0.1 mR/hr background.

The ability of a person to find contamination is not only based on the detector’s efficiency, but also its response time and the ability of the operator to determine the change in reading. Since an instrument type is not specified, an ion chamber (commonly used in response) could be selected which would make detection of harmful levels of difficult due to lack of audio feedback and slow response time.

Without providing amplifying information on the type of instruments to be used and the method of survey, the current screening levels used in the 2013 PAG Manual may not be able to detect contamination levels on people that could result in acute effects and increased risk of cancer, even when measurements are made in low background areas.

Why the guidance <u>may cause more harm than benefit</u>

In addition to potentially missing significant levels of contamination (using the wrong instrument, technique, or operating in a high background area), the "2X Background" can also result in being too sensitive when applied to a sensitive instrument held stationary over a particular spot.

This is likely to happen when contamination is discovered on a person. According to Table 2-6 of the 2013 PAG Manual, a person with detectable contamination would be sent through simple decontamination (flushing with water and wiping) and then monitored again.

Given that the location of the contamination on the body is known, the responder is likely to make a stationary, close measurement of the area with a sensitive pancake meter. Even a small amount of remaining contamination would likely resulting in another positive "2X background" reading. The person is then put through a full decontamination (washing or gentle scrubbing with soap) and monitored again.

Again, the responder is likely to make a stationary, close measurement of the area with a sensitive pancake meter, resulting in another positive "2X background" reading. These stationary, close readings can find very low levels of (< 100 dpm/cm^2) contamination that are essentially harmless to the person, but the guidance is to "***Continue to decontaminate.***"

This can result in harm as even "gentle scrubbing" if repeated several times will result in reducing the skin as a barrier, allowing the radioactive material to enter the body.

Low levels of detectable contamination are not a health risk (either acute or stochastic) and should not be managed as a medical issue requiring "special evaluation." This will deplete and distract important decontamination capabilities and medical resources from victims who have actual health risks.

Instead of "2X background," it is far better to identify a specific level of contamination that, based on calculated risk, action is warranted to avoid the exposure. An example of this calculation can be found in the FEMA document (Background information of FEMA-REP-22) which uses dose conversion factors of EPA 520/1-89-016 *Evaluation of Skin and Ingestion Exposure Pathways* to convert skin contamination to skin dose at a skin depth of 7 mg/ cm^2 to derive the threshold Minimum Detectable Level of activity on a 0.2 cm^2 spot to **avoid** acute exudative radiodermatitis. Similar calculations were done to calculate protection from skin cancer.

For both spot and widespread skin contamination, protective threshold surface contamination values were calculated for both fixed (presumed prolonged exposure) and loose (easily decontaminated, therefore shorter exposure) contamination. See the top line of table below for more information.

Examples of national and international guidance for contamination

Source	Screening Level	Monitoring or Post Decon Level	Notes
Contamination Monitoring Guidance for Portable Instruments Used for Radiological Emergency Response to Nuclear Power Plant Accidents, Federal Emergency Management Agency, FEMA-REP-22, October 2002	Acute: Spot contamination of 1.0 µCi (37 kBq) Stochastic: 0.04 µCi/cm_2, (1.5 kBq/cm^2 or 90,000 dpm/cm^2) Operationally, this resulted in: 10 mR/h (CDV-718 GM); 10,000 cpm (CDV-700 Pancake); or 100,000 CPM (modern GM Pancake)	Acute: Spot contamination of 0.1 µCi (3.7 kBq) Stochastic: 0.004 µCi/cm_2 (0.15 kBq/cm^2 or 9,000 dpm/cm^2) Operationally, this resulted in: 1 mR/h (CDV-718 GM) or 1,000 cpm (CDV-700 Pancake); or 10,000 CPM (modern GM Pancake)	It was presumed that the ***screening level*** referred to the limit on "loose contamination" which is presumed to stay on the person 36 hours. The (lower) ***monitoring level*** was for the limit on fixed contamination and presumed to stay on the person 2 weeks. Note: both acute (spot) and stochastic (uniform distribution) activity levels result in similar detectability for each column, noted as the operational measurements for two different types of instruments.
Key Elements of Preparing Emergency Responders for Nuclear and Radiological Terrorism, National Council on Radiation Protection and Measurements (NCRP) Commentary No. 19, December 2005	Spot contamination on the skin exceeding 1 µCi (37 kBq) have priority for decontamination.	Decontamination procedures should "strive to reduce" surface contamination to below the following limits: • *0.1 µCi (3.7 kBq) on any one spot.* • *10,000 dpm/cm^2 (167 Bq/cm_2) surface body contamination*	Note that NCRP contamination guides are numerically similar or equal to FEMA's limits, however they are stated in different ways: The ***screening level*** is defined as the level when a person becomes a priority for decontamination (i.e., action is **warranted**). The (lower) ***monitoring level*** is defined as the level that "decontamination procedures should strive to achieve"
Handbook for Responding to a RDD. First Responder's Guide— the First 12 Hours, Conference of Radiation Control Program Directors, Inc.(CRCPD), 2006	*In case of a large incident or if adequate resources are not available: GM Pancake Probe: 10,000 cpm (0.05 mR/h using a gamma detector)*	*GM Pancake Probe: With contamination levels up to 1,000 cpm, people can be instructed to go home and shower*	The CRCPD manual takes the opposite approach of defining a level below which people can *be instructed to go home and shower*, instead of defining a level above which some action should be taken.

Manual for First Responders to a Radiological Emergency, International Atomic Energy Agency (IAEA), October 2006	0.1 mrem/h (1 μSv/h) measured at 10 cm (4 inches) from the body *>600,000 dpm/cm2 (10,000 Bq/cm2) beta/gamma contamination.* *> 60,000 dpm/cm2 (1,000 Bq/cm2) for alpha contamination.*		*"These criteria indicate the level of skin contamination which could represent a hazard from direct irradiation of the skin, from intake by inadvertent ingestion, or that could indicate that the person has already inhaled or ingested significant amounts of radioactive material."* *"The criteria were established at levels which are below those at which contaminated people would experience deterministic health effects warranting medical treatment or follow-up. The criteria were established at levels which are below those at which contaminated people would experience deterministic health effects warranting medical treatment or follow-up."*
NCRP Report No. 165: Responding to a Radiological or Nuclear Terrorism Incident: A Guide for Decision Makers (2010)	>0.1 mR h^{-1} exposure rate (~1 μGy h^{-1} air-kerma rate) at 10 cm, >600,000 dpm cm^2 (10,000 Bq cm^2) beta and gamma surface contamination, or >60,000 dpm cm^2 (1,000 Bq cm^2) for alpha surface contamination		Essentially the same screening levels as IAEA (2006): *"Decontamination (skin and clothing) should always be performed [at the Screening levels]."* *"Target levels for adequate decontamination should be in the local and regional emergency plans, but may be modified at the time of the response. These levels may be different than "any detectable level of contamination" and depending on the number of people to be monitored may make surveys with this level of detail impractical (CRCPD, 2006; NCRP, 2005)."*
NCRP Report No. 166: Population Monitoring and Radionuclide Decorporation Following a Radiological or Nuclear Incident (2010)		1,000 cpm using a *GM Pancake probe. This document estimated this contamination to be* ~670 dpm/cm^2*(see below)*	Although the 1,000 cpm value was listed as "screening," the text indicated it was a non-urgent value in alignment with the monitoring definition above: "*Persons with more than this level of contamination on their skin should be decontaminated when it is possible and appropriate to do so, and persons with less than this level of contamination may be sent home."*

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Not Scientifically Derived:

The stated technical basis is that the "screening levels are examples derived primarily on the basis of easily measurable radiation levels using portable instruments," which is not a risk derived basis. The 2013 PAG Manual should set objective guidelines based on risk, not "whatever can measured." It should be up to the implementing organizations to then determine how to use their instruments to meet the requirement, or obtain instruments that can meet the need.

An example of a more rigorous risk and dose based derivation can be found in "Contamination Monitoring Guidance for Portable Instruments Used for Radiological Emergency Response to Nuclear Power Plant Accidents, Federal Emergency Management Agency, FEMA-REP-22," October 2002 shown in the table above. The following is quoted from the document.

> **Acute Exudative Radiodermatitis threshold dose was calculated** "based on dose conversion factors in Appendix B of EPA 520/1-89-016 *Evaluation of Skin and Ingestion Exposure Pathways* (Reference 4) for the mix of radionuclides assumed to be associated with a major reactor accident, the factor to convert skin contamination to skin dose at a skin depth of 7 mg/cm^2, is about 7 rem/h per µCi/cm^2. Therefore, if the activity is concentrated in a 0.2 cm^2 area, then the threshold MDL of activity on the spot to **avoid** acute exudative radiodermatitis is **34 µCi h** (i.e., 1,200 rem on a spot / 7 rem per µCi h/cm^2 x 0.2cm^2). Dividing 34 µCi h by 36 h and 336 h of exposure yields **0.95 µCi** and **0.10 µCi** for loose and fixed contamination respectively."
>
> **Skin Cancer Risk was calculated** based on a "time-integrated concentration on the skin that would produce a dose of 10 rem. The factor to convert from time-integrated skin contamination to a dose of 10 rem is **1.4 µCi h/cm^2** (i.e., 10 rem /7 rem per µCi h/cm^2). To determine the time-integrated activity necessary to yield a dose of 10 rem to the skin of the whole body, it is necessary to multiply the time-integrated concentration per square centimeter that will yield a dose of 10 rem times the area of the skin on the whole body (about 18,000 cm^2 for an adult)... [T]he threshold level corresponding to adequate protection of the public from skin cancer under emergency conditions is a time-integrated activity of **25,200 µCi h** (i.e., 1.4 µCi h/ cm^2 x 18,000 cm^2). This is independent of the distribution of the contamination on the skin. Dividing 25,200 µCi h by 36 h and 336 h of exposure yields rounded values of **700 µCi** and **75 µCi** for loose and fixed contamination respectively. Since a portable instrument would view only a small area of skin, the threshold level in activity per unit area (µCi/ cm^2) is of interest. This is calculated by dividing the activity on the total body by the area of the skin of the total body (18000 cm^2). This yields **0.039 µCi/cm^2** and **0.0042 µCi/ cm^2** as the concentrations of concern regarding risk of cancer from loose and fixed widespread contamination respectively."

Another example of a rigorous derivation can be found in NCRP Report No. 166: Population Monitoring and Radionuclide Decorporation Following a Radiological or Nuclear Incident (2010):

"The area of a typical pancake-type detector is 15 cm^2. If the counting efficiency of the detector is 10%, then 1,000 cpm in the area beneath the detector corresponds with a total of 10,000 dpm over 15 cm^2 (~670 dpm/cm^2). Calculations performed using VARSKIN 3 (Durham, 2006) indicate that skin dose from ^{90}Sr (a high-energy beta emitter) contamination is 2.5×10^{-2} μSv/h (2.5×10^{-3} mrem/h) for 1 dpm-cm, so 670 dpm/cm^2 result in a skin dose of ~16.5 μSv h_{-1} (1.65 mrem/h). This level of exposure will produce a radiation dose of <0.5 mSv (50 mrem) to the skin even if left unwashed for 24 h and poses no physical risk to the contaminated person. Assuming more realistic counting efficiencies for high-energy beta emitters (many pancake-type GM probes are 30 to 40 % efficient for this energy of beta radiation) reduces the dose further. An action level of 1,000 cpm should remain protective of health from uptake through broken skin (*e.g.*, wounds) or through the mouth or nose. The amount of radioactivity contained in 670 dpm is ~112 Bq (~4 nCi). This level of uptake is much lower than the most limiting CDG listed in Table 3.14 of NCRP Report No. 161 [5,200 Bq (0.14 μCi) for ^{227}Ac] (NCRP, 2008a)."

Note that NCRP 166 derived surface contamination of ~670 dpm/cm^2 was to avoid a dose of 0.05 rem if the material stayed on the skin for 24 hours. Using this methodology on the 2013 PAG Manual's organ specific dose guidance of 5 rem (inferred by Table 1-1), then the skin contamination guideline would be closer to 67,000 dpm/cm^2

As a comparison, if we convert the FEMA guidance of 90,000 dpm/cm^2 (based on 10 rem skin dose over to 36 hours) to the equivalent 5 rem skin dose in 24 hours, we would get a remarkably similar 67,500 dpm/cm^2. This demonstrates consistent results despite the different calculation methods.

Emergency deposition and unconditional release of contaminated vehicles and equipment:

During the emergency phase, the IAEA emergency response guidance provided guidance for potentially contaminated equipment and vehicles may be useful, I have converted to traditional units:

Equipment or vehicle contamination criteria

For use by first responder monitor:
Ambient dose rate at 10 cm:
> 0.1 mR/h (1 μSv/h) and < 1 mR/h (10 μSv/h): use of equipment or vehicle for response activities only
> 1mR/h (10 μSv/h) and < 10 mR/h (100 μSv/h): allow use of equipment or vehicle for critical response activities only
> 10mR/h (100 μSv/h): isolate equipment or vehicle and use only with radiological assessor approval

Discussion

These criteria can only be used to assess contamination from gamma emitters and can not be used to adequately assess beta and alpha contamination which could represent a hazard from intake by inadvertent ingestion or skin dose from contamination. Therefore the response personnel using equipment that may be contaminated should always take actions to reduce intake from inadvertent ingestions (e.g. wash hands and face) and skin dose from contamination (e.g. wear gloves).

The criteria were set up on the levels to ensure that responders are protected and that critical equipment will remain available:

> 0.1 mR/h (1 μSv/h) and < 1 mR/h (10 μSv/h):
At this level there is no hazard of severe deterministic health effects from external exposure. This level was established to be consistent, assuming a 10% transfer rate, with that at which public and responders would be advised to be decontaminated in accordance with Instruction 5.
> 1mR/h (10 μSv/h) and < 10 mR/h (100 μSv/h):
Allow use of critical items. This level may be the lowest ambient dose rate that can be effectively measured near the boundary of the inner cordoned area. For gamma emitters the dose resulting from the use of items contaminated at this level will be well below that resulting in severe deterministic health effects.
> 10mR/h (100 μSv/h):
Isolate and do not use without approval of radiological assessor. This criterion is at a level that *should be* well below that resulting in severe deterministic health effects for gamma emitters. However, it was selected to ensure that severe deterministic health effects are not possible taking into account uncertainties in measurement techniques.
Generally conservative assumptions were used to establish these criteria. It is assumed that the contaminated area is almost in contact, through clothing, with a specific area of tissue for 10 hours. Experience has shown that a much lower dose would be expected in the tissue due to movement of the source relative to the tissue over the 10 hours. It is also assumed that the ambient dose rate to the tissue itself is 1000 or more times the ambient dose rate measured at 10 cm. Assumptions used in calculation will overestimate the ambient dose rate to the tissue for most contamination scenarios (e.g. if the contamination covers an area of more than about 1 cm_2).

When not in the emergency phase, acceptable guidance can be found in standards like **ANSI/HPS N13.12-1999: Surface and Volume Radioactivity Standards for Clearance. Table 1 of that standard is provided for reference.**

Table 1 Screening levels for clearance

Radionuclide Groups[a]	Screening Levels (S.I. Units)[b]	Surface Screening (Conventional Units)[b]	Volume Screening (Conventional Units)[b]
	(Bq/cm^2 or Bq/g)[c]	(dpm/100 cm^2)	(pCi/g)
Group 1 Radium, Thorium, and Transuranics: ^{210}Po, ^{210}Pb, ^{226}Ra, ^{228}Ra, ^{228}Th, ^{230}Th, ^{232}Th, ^{237}Np, ^{239}Pu, ^{240}Pu, ^{241}Am, ^{244}Cm, and associated decay chains[d], and others[a]	0.1	600	3
Group 2 Uranium and Selected High Dose Beta-Gamma Emitters: ^{22}Na, ^{54}Mn, ^{58}Co, ^{60}Co, ^{65}Zn, ^{90}Sr, ^{94}Nb, ^{106}Ru, ^{110m}Ag, ^{124}Sb, ^{134}Cs, ^{137}Cs, ^{152}Eu, ^{154}Eu, ^{192}Ir, ^{234}U, ^{235}U, ^{238}U, Natural Uranium[e], and others[a]	1	6,000	30
Group 3 General Beta-Gamma Emitters: ^{24}Na, ^{36}Cl, ^{59}Fe, ^{109}Cd, ^{131}I, ^{129}I, ^{144}Ce, ^{198}Au, ^{241}Pu, and others[a]	10	60,000	300
Group 4[f] Other Beta-Gamma Emitters: ^{3}H, ^{14}C, ^{32}P, ^{35}S, ^{45}Ca, ^{51}Cr, ^{55}Fe, ^{63}Ni, ^{89}Sr, ^{99}Tc, ^{111}In, ^{125}I, ^{147}Pm, and others[a]	100	600,000	3,000

(a) To determine the specific group for radionuclides not shown, a comparison of the effective dose factors, by exposure pathway, listed in Table A.1 of NCRP Report No. 123I (NCRP 1996) for the radionuclides in question and the radionuclides in the general groups above shall be performed and a determination of the proper group made, based on similarity of the factors.
(b) Rounded to one significant figure.
(c) The screening levels shown are used for either surface activity concentration (in units of Bq/cm^2), or volume activity concentration (in units of Bq/g). These groupings were determined based on similarity of the scenario modeling results, as described in Annex B.
(d) For decay chains, the screening levels represent the total activity (i.e., the activity of the parent plus the activity of all progeny) present.
(e) Where the Natural Uranium activity equals 48.9% from ^{238}U, plus 48.9% from ^{234}U, plus 2.25% from ^{235}U.
(f) Radionuclides were assigned to groups that were protective of 10 μSv/y (1.0 mrem/y) and were limited to 4 groups for ease of application, as discussed in Annex B.

Recommended Resolution for Section 2.8

For the reasons discussed above the "2X background" as a PAG reference value is inappropriate for a final evaluation of a person's risk, though it can be used in high background areas as an indicator of "something significant." However it should not be used as unconditional release criteria as measurements made in high background areas can hide significant contamination.

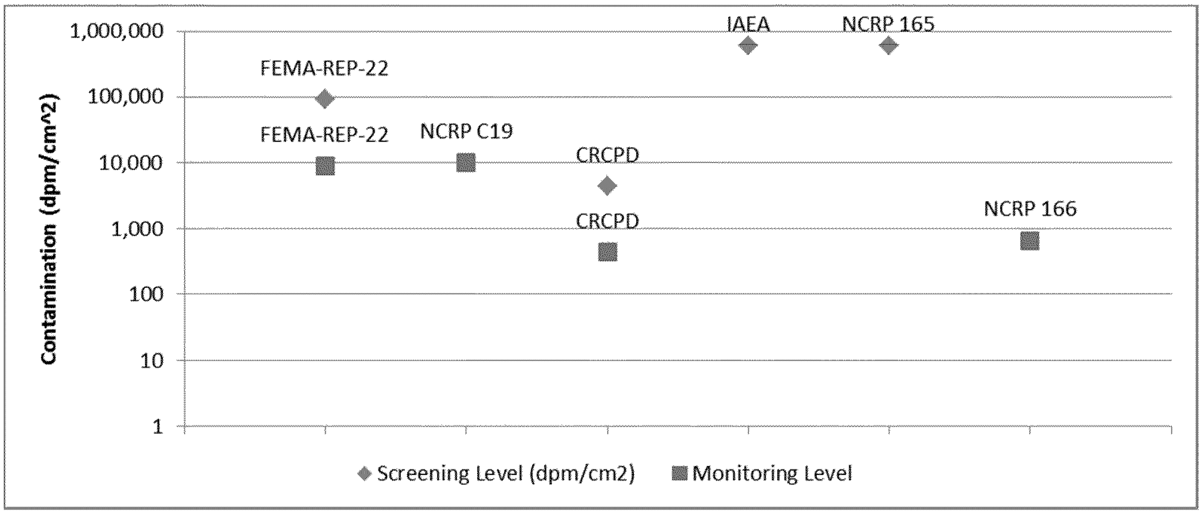
Suggested revision of paragraph #4:

***When early screening is needed after a major incident*— After plume passage, it may be necessary to establish emergency contamination monitoring stations in areas not qualifying as low background areas. Gamma exposure rates in such areas should be less than 10 millirem (100 µSv) per hour. These monitoring stations should be used only during the early phase after major atmospheric releases to monitor people emerging from possible contamination areas. The stations should be set up to provide simple (rapid) decontamination if needed and to evaluate whether affected people should undergo more extensive decontamination or other special care. Table 2-5 provides guidance on surface contamination levels for use if such centers are needed.**

Table 2-5. Recommended Surface Contamination Screening Levels for Emergency Screening of People and Objects at Screening Station in High Background Radiation Areas (0.1 mR/h to 10 mR/h Gamma Exposure Rate)

Ambient dose rate at 10 cm from surface	**Recommended Action**
<2x existing background	Forward to low background area for further screening
>2x existing background, or > 0.1 mR/h (1 µSv/h) and < 1 mR/h (10 µSv/h)	Use of equipment or vehicle for response activities only*
> 1mR/h (10 µSv/h) and < 10 mR/h (100 µSv/h)	Allow use of equipment or vehicle for critical response activities*
> 10mR/h (100 µSv/h)	Isolate equipment or vehicle and use only with RadCon approval*
>2x existing background on person	Decontamination if available then forward to low background monitoring area for further assessment.
Screening stations in such high exposure rate areas are for use only during the early phase of an incident. Screening is performed rapidly (< 5 minutes) on each person or object, often checking only likely contamination areas on the object or person.	

As noted above, there is not an accepted standard for appropriate monitoring levels. As can be seen by the chart below national and international recommendations vary by orders of magnitude. However the concept and technical bases for these standards lay the groundwork for an appropriate 2013 PAG Manual reference level.



Using the calculation method provided in FEMA-REP-22 and NCRP 166, a new table 2-6 can be constructed based on dose and risk values that align with the technical basis of the 2013 PAG Manual. To do this, the 2013 PAG Manual authors need to define:

1) What is the skin dose (organ dose) where actions are suggested or warranted?
2) What is the presumed length of exposure, particularly the presumed time before initial decontamination?

Example Revised Table Text

If, for example, the actionable skin dose is 10 rem and the assumed time to decon (without assistance) is 36 hours then the monitoring objective can be based on FEMA-REP-22 (which is guidance that is already in practice for nuclear power response).

Table 2-6. Recommended Surface Monitoring Levels for People[a] and Objects at Monitoring Stations in Low Background Radiation Areas (<0.1 mR/h Gamma Exposure Rate)

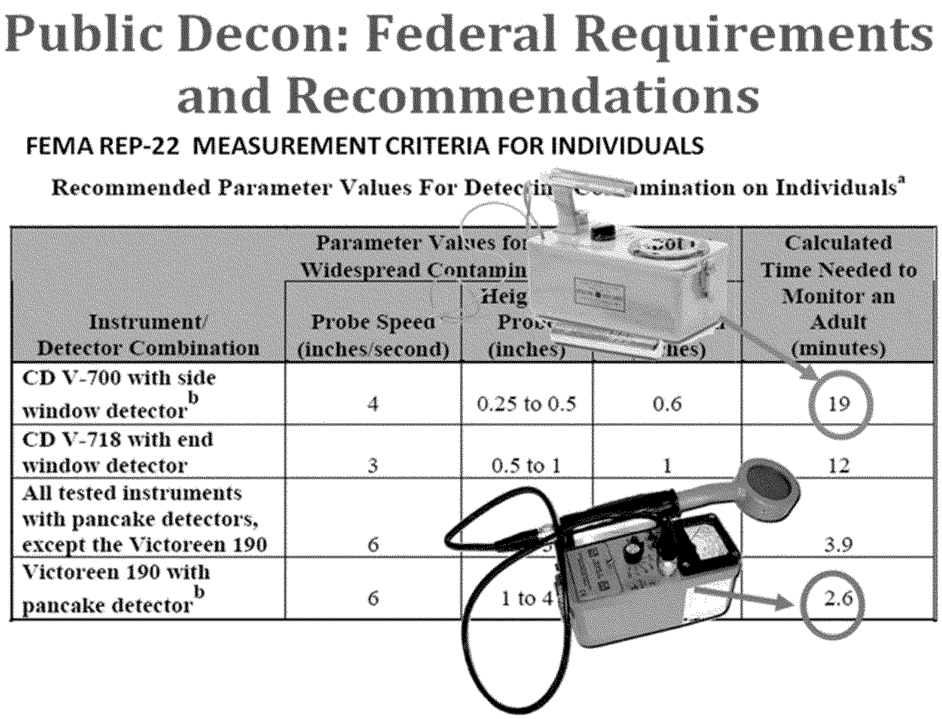
Measurement Criteria	**Recommended Action**
Equipment: dose rate at 10 cm from surface of > 0.1 mR/h (1 μSv/h) and < 1 mR/h (10 μSv/h)	Use of equipment or vehicle for response activities only*
Equipment: dose rate at 10 cm from surface of > 1mR/h (10 μSv/h) and < 10 mR/h (100 μSv/h)	Allow use of equipment or vehicle for critical response activities*
Equipment: dose rate at 10 cm from surface of > 10mR/h (100 μSv/h)	Isolate equipment or vehicle and use only with RadCon approval*
Equipment and Vehicles < 0.1 mR/h (1 μSv/h) at 10 cm from the surface.	Use appropriate release criteria (like ANSI N13.12) to determine if suitable for unconditional release.
If personnel contamination > 90,000 dpm/cm^2 , spot contamination > 2.2x10^6 dpm (1 uCi), or radiation reading >0.1 mR/h (1 μSv/h) at 20cm	Priority for decontamination, change clothing, gently wash exposure skin and hair. Resurvey after decontamination.
If personnel contamination > 9,000 dpm/cm^2, or spot contamination > 2.2x10^5 dpm (0.1 uCi).	Simple decontamination: flushing with water and wiping is an example of a simple decontamination effort. If resurvey still above measurement criteria then change clothing, gently wash exposure skin and hair. If unable to get below 10,000 dpm/cm^2 then send for special evaluation.
*Decontamination can be attempted (resurvey afterward) or equipment may be stored or disposed of as appropriate. [a]People reporting to monitoring stations in low background radiation areas have been previously instructed to change and bag clothes, wash other exposed surfaces such as cars and their contents and then report to these centers for monitoring. Monitoring is a more thorough assessment than screening, often using sensitive Pancake GM detector within a few inches of the surface. Specific instructions for monitoring can be found in CDC's *Population Monitoring in Radiation Emergencies: A Guide for State and Local Public Health Planners*	

The highlighted text can be scaled if you use a different organ dose objective or assumed time that loose contamination is on the body.

Although contamination levels such as 9,000 dpm/cm2 or spot contamination levels of 2.2x105 dpm may appear large, they are actually quite difficult to detect while frisking (scanning the surface of an object or person). Specific minimum detection levels for various instruments for a variety of frisking speeds can be found in the Background document for FEMA-REP-22 or calculated using "Rad Pro Calculator" found on http://www.radprocalculator.com/

Note: a more restrictive release criteria will result in longer survey times:

For example , in order to find 9,000 dpm/cm^2, it would take nearly 20 minutes using a common CDV-700 hotdog GM. Even with a modern Pancake GM instrument it will take 3-4 minutes per person.



Public Decon: Federal Requirements and Recommendations

FEMA REP-22 MEASUREMENT CRITERIA FOR INDIVIDUALS

Recommended Parameter Values For Detec[illegible]mination on Individuals[a]

Instrument/ Detector Combination	Parameter Values for [illegible] Widespread Contamin[illegible]			Calculated Time Needed to Monitor an Adult (minutes)
	Probe Speed (inches/second)	Heig[illegible] Pro[illegible] (inches)	[illegible]	
CD V-700 with side window detector[b]	4	0.25 to 0.5	0.6	19
CD V-718 with end window detector	3	0.5 to 1	1	12
All tested instruments with pancake detectors, except the Victoreen 190	6	[illegible]	[illegible]	3.9
Victoreen 190 with pancake detector[b]	6	1 to 4	[illegible]	2.6

If there are a large number of people to be monitored, this can result in a significant delay in discovery.

Conference of Radiation Control Program Directors, Inc.

Office of Executive Director ❖ 1030 Burlington Lane, Suite 4B ❖ Frankfort, KY 40601
Phone: 502/227-4543 ❖ Fax: 502/227-7862 ❖ Web Site: www.crcpd.org

September 16, 2013

Air and Radiation Docket and Information Center
Environmental Protection Agency
Mail Code 6102 T
1200 Pennsylvania Ave NW.
Washington DC, 20460

Attn: Docket ID No EPA-HQ-OAR2007-0268

The Conference of Radiation Control Program Directors, Inc. (CRCPD) is a professional organization dedicated to radiation protection. The mission of CRCPD is to promote consistency in addressing and resolving radiation protection issues, to encourage high standards of quality in radiation protection programs, and to provide leadership in radiation safety and education. CRCPD's primary goal is to make sure radiation exposure to individuals is kept to the lowest practical level, while not restricting its beneficial uses. CRCPD's membership includes the directors and members of State radiation control programs across the nation as well as other individuals interested in radiation protection issues. Many of our member States have nuclear power plants within their jurisdictions, and many of them also have actual long-term contaminated site clean-up experience.

CRCPD believes the efforts of the EPA to revise the current PAG Manual are a positive step. To the extent possible, we have attempted to provide comments on the specific issues that were requested in Section E of the Federal Register Notice. Those comments as well as other detailed comments are attached. However, we have some generic comments that apply to the entire document that we feel should be addressed before this new manual is considered final.

The title of the PAG Manual is "Protective Action Guides and Planning Guidance for Radiological Incidents." The first three chapters are clearly focused on the basis for the PAGS, the numerical values for comparing projected dose, and the actions that should occur when EPA PAGs are exceeded. The fourth chapter focuses more on planning guidance and does not include specific PAG values for long term return and recovery decision making. Therefore, we feel that the title of the fourth chapter should be changed to "Planning Considerations for the Late Phase" instead of "Guidance for the Late Phase."

The CRCPD feels that referencing the 1992 version of the PAG manual is detrimental to the purpose of the new manual and could lead to confusion. When the new version of the manual becomes final, it should completely replace the old version. CRCPD feels that the sections of the old PAG manual that are still applicable should be contained in the new PAG manual. In addition we feel some of the references contained in the new version have not been updated. An example of this is the reference to the Reactor Safety Study in section 2.4.2. This section should be updated to reference current understanding of reactor accidents as discussed in NUREG-1935, the SOARCA Report. EPA should take another look at all the references in the document to ensure they are all the most current and applicable.

On a final note the CRCPD would like to see the new EPA PAGs adopted eventually as Presidential Guidance. As this will take additional time, we also recommend the new EPA PAGs are not held up while this Presidential Guidance is sought.

Thank you for considering these comments and requests. The CRCPD stands ready to assist our Federal partners and are available to provide additional details on any of these issues should you desire. I look forward to your response.

Sincerely,

Joseph Klinger

Joe Klinger, Chairperson
Conference of Radiation Control Program Directors

Attachments

ATTACHMENT 1

SPECIFIC COMMENTS SOUGHT BY EPA
Manual of Protective Action Guides

1. To implement the PAGs, the reader is referred to dose calculations in the Federal Radiological Monitoring and Assessment Center (FRMAC) Assessment Manuals. The Assessment Manuals are updated with current International Commission on Radiological Protection (ICRP) dosimetry models (i.e., ICRP 60 series) and dose coefficients. The FRPCC also encourages the use of computational tools such as DOE's Turbo FRMAC, RESRAD RDD and NRC's RASCAL or other appropriate tools and methods to implement the PAGs. We request comment on the usefulness of this approach and seek feedback on how to facilitate implementation of these methods in emergency management plans.

CRCPD understands why EPA has chosen to recommend the use of computational tools such as Turbo FRMAC and RASCAL to calculate values to be compared to the PAGs. While we are in basic agreement with this concept, it should be made clear there may be a slight difference in results depending on which model is used.

The 1992 Manual of Protective Action Guides and Protective Actions for Nuclear Incidents (EPA 400-R-92-001, May 1992) contained tables and charts that provided Dose Conversion Factors and Derived Response Levels for various radionuclides along with formulas for calculating these values. The FRMAC Assessment Manual and their Turbo FRMAC program for dose assessment do not use these terms in the same manner as the original document. The updated guidance should use consistent terminology as FRMAC or refer to their methods and tools generically as "the most current DOE/FRMAC Assessment Tools." Further, the table and charts found in the 1992 version of the PAG Manual were useful for state assessment staff as a quick reference guide. Lacking these tables and charts, it would be useful to have a single repository for all the tools available for accident assessment for various radiological accidents. Currently, Turbo FRMAC is distributed and updated through distribution of CDs to licensed organizations. RESRAD RDD is available but (from my understanding) has issues running on some IT platforms that states use.

We suggest that EPA, in conjunction with the FRPCC, consider developing web access to radiological assessment tools and reference material so that the most current versions and updated documents and guidance are accessible in a "onestop" format. It would also be extremely beneficial for the assessment tools to be web based so that distribution and updates are no longer necessary. This would allow all states to access the most current version of tools, documents and guidance that are necessary for the assessment of all types of radiological accidents, i.e. NPP, RDD, IND. It would ensure the consistent application of assessment principles and would facilitate updating methods over time as changes are made to dose calculations models (i.e. RASCAL, TurboFRMAC), dosimetry models (i.e. ICRP guidance) and other documents that would affect the calculations for radiological dose.

The Agency recognizes a short-term emergency drinking water guide may be useful for public health protection in light of the Fukushima nuclear power plant accident, which impacted some Japanese drinking water supplies. Input on the appropriateness of, and possible values for, a drinking water PAG is being sought.

CRCPD recommends that the final version of the PAG manual have guidance for drinking water. It is critical for situations where there are no reasonable alternative water supplies for the short term, the drinking water supply contains radioactive materials that would exceed Safe Drinking Water Standards, access to drinking water is crucial to public health, and relocation/evacuation is not feasible at that point in time. Part of this discussion should include the evaluation and consideration of the Department of Homeland Security Document, Planning Guidance for Protection and Recovery Following Radiological Dispersal Device and Improvised Nuclear Device Incidents. Interestingly, this document, issued in 2008, includes a PAG for water, Table-1, at 0.5 Rem (0.005 Sv) projected in the first year. The document states that "These values are consistent with those now used or being considered as PAGs for other types of nuclear/radiological incidents." Further, the DHS document states:

"By agreement with the Environmental Protection Agency (EPA), the Guidance being published today is final and its substance will be incorporated without change into the revision of the 1992 EPA Manual of Protective Actions Guides and Protective Actions for Nuclear Incidents (the PAG Manual). This notice of final guidance will therefore sunset upon publication of the new EPA PAG Manual (see, http://www.epa.gov/radiation/rert/pags.html). The reader will then be directed to the new EPA PAG Manual, where these provisions may be found."

It is unclear where the updated PAG guidance brings us regarding the PAG for Drinking Water. The guidance was not adopted as written (as stated in the DHS document) and the DHS guidance has sunset according to the language cited above. This leaves no recognized basis for establishing a drinking water intervention level other than those in the Safe Drinking Water Act. CRCPD does not believe that these threshold values are practical for application during significant radiological emergencies where there is widespread contamination of the drinking water supply. The 4 mRem threshold used for drinking water standards is based on multiple assumptions that include a 70-year committed dose from consumption. This is not a reasonable assumption for application during an emergency.

The EPA has provided a number of alternatives for drinking water supplies during emergency conditions that provide a means for reducing and/or avoiding dose. Recommendations should be made to consider these options and their feasibility for implementation prior to consideration of intervention levels for drinking water above the safe drinking water standards. However, if the public health risk of not having a water supply is greater than the risk of the dose received from drinking slightly contaminated water, then alternative drinking water intervention levels should be established for the short term untilan acceptable drinking water supply can be made available.

The parameters for this decision and the intervention level should be based upon the current guidance that FDA provides for food and milk combined with those established by DHS for IND/RDD events. For the Intermediate Phase, CRCPD suggests that water be included in the dose consideration for the ingestion pathway as a single value of 500mRem per year (provided that alternative water supplies are not available or feasible). That should be the upper bound of exposure from the ingestion of food, water and milk combined. Water should not be treated as a separate exposure pathway since water is a key component of diet in many ways and cannot actually be separated. During this period, the supplier shall attempt to locate and supply water that will be in compliance with the Drinking Water Standards. Water used for the production of food stuffs shall result in food levels not exceeding the FDA DILs.

It should also be noted, that any intervention level set is for interim use only, and every reasonable and feasible action should be taken to ensure that drinking water supplies for the public are brought back to an acceptable level or "normalcy" as soon as reasonably achievable.

2. The most substantive PAG change in the Early Phase is the 2001 guidance from the FDA that lowers the threshold for administration of potassium iodide (KI) to the public from 25 rem projected adult thyroid dose to 5 rem projected child thyroid dose. Chapter 2 includes a streamlined implementation scheme based on FDA's guidance. Please comment on the usefulness of this simplified guidance in the text of Chapter 2.

CRCPD has several comments about section 2.3.4.

The decision to stockpile and distribute Potassium Iodide (KI) to the general public during a nuclear emergency is a state and local government decision. There are some states that stockpile and pre-distribute, others that stockpile and distribute through Reception Centers and others that choose not to stockpile at all. The FDA provides guidance that discusses in detail the intervention thresholds and dosages for each specific age group. In this sense, the prophylactic use of KI is not a public Protective Action per se but a supplemental action that state and local decision makers use according to the plans and procedures in place.

The new EPA PAG Manual has not only referenced the 2001 FDA guidance on KI but also reproduced certain sections of the document. We understand the need to simplify the guidance for issuing KI but it is important to not leave out the dosing information for KI that was contained in the 2001 FDA guidance. It is recommended that the PAG Manual be simplified by referencing the 2001 FDA recommendations for KI and omit the proposed excerpts from the guidance. Additionally, some states do NOT recommend KI to the public. Therefore, we agree with listing KI as a supplemental protective action.

3. The skin and thyroid evacuation thresholds were removed to avoid confusion with the KI threshold. The skin and thyroid doses were 5 and 50 times higher, respectively, than the 1 to 5 rem whole-body dose guideline. Please comment specifically on the appropriateness of not retaining the skin and thyroid evacuation thresholds.

Some states wish to continue to use a Thyroid PAG as they do not currently issue KI to the public. Therefore we recommend including language in the document that states may continue to use a Thyroid PAG for evacuation or shelter if they wish to add this additional PAG to ensure the public health and safety is protected in all possible scenarios.

4. The most substantive PAG change in the Intermediate Phase is the removal of the 5 rem over 50 years relocation PAG which was potentially being confused with long term cleanup. Please comment on the appropriateness of this change.

We feel that the removal of the long term PAG of 5 Rem is appropriate. Consideration out to 50 years should be part of the late phase/clean up criteria, not part of an intermediate phase PAG.

5. **As an extension of the PAGs, new guidance on reentry to relocation areas is provided to inform plans and procedures to protect workers and members of the public as the Intermediate Phase progresses. Please comment on the format and utility of this material.**

We feel that additional guidance on reentry is beneficial. However, the current format and content could be enhanced. The current guidance should include not only total dose that the individual should not exceed, but also provide guidelines on exposure rates, site specific conditions, and environmental conditions that should be considered before authorizing permission for reentry.

6. **Please comment on whether it would be useful to develop a new, combined Intermediate Phase PAG considering all exposure pathways to potentially simplify decision making**.

We agree with keeping the relocation PAG separate from the food PAG because the required actions to implement are so different (moving people vs. embargoing food products). However, as noted earlier, we believe that it would be beneficial to include drinking water in the estimation of ingestion pathway food and milk PAGs not to exceed a 500 mRem dose in the first year.

7. A brief planning guidance on the cleanup process is included. Please comment on the usefulness of this information, as well as how it might best be implemented in state, tribal and local plans.

This material might be better suited for an appendix. By making the guidance more of a checklist format it may also be more useful.

8. **A suggested process and organization for approaching the late phase cleanup is provided from the 2008 RDD-IND Planning Guidance. Please comment on the merging of that guidance with the 2013 PAG Manual**.

The CRCPD feels strongly that the new EPA PAG Manual needs more definitive guidance for State planners on how to implement the cleanup process. The material presented in Chapter 4 of this document and the DHS RDD-IND Planning guidance provides a "theoretical" approach to a systematic process for evaluation of long term impacts, what considerations need to be made and what stakeholders need to be involved in the process. All this information is useful for setting up the process. However, as a technical document, the EPA PAG Manual provides no guidance, references or tools to perform the technical assessment of key parameters required for decision making. That is, there is no actual guidance for the practical implementation of the process. For example, there is no method or tool identified to evaluate comparative risk for various clean-up standards. Is there a tool to assist with evaluating the risk between a 100 mRem a 50 mRem and a 25 mRem clean up standard? There is no tool or method identified in the document to assist with the evaluation of the amount of waste generated from different clean up options. Using the above example, it is imperative that decision makers understand how choosing a lower clean-up threshold affects waste generation and disposal costs. Is there a tool or method that can be used to estimate these values?

A suggestion would be to provide a toolkit, guidance or references which would provide a means to calculate parameters such as cost and volume of waste based on cleanup standards. One of the problems associated with the optimization process is that for large incidents there could be adjacent geopolitical areas that have established different clean-up standards. This will lead to confusion and possible litigation. It is imperative that there be some standards established ahead of time that states can reference in order to promote consistency in the process for decision making.

9. Basic planning guidance on approaching radioactive waste disposal is included. Please comment on this material and how it should be implemented in emergency response and recovery plans at all levels of government.

It is inappropriate for the guidance to state that the consideration and disposal of waste generated through cleanup efforts following a significant radiological event is a state and local decision and consideration. Based on the data made available from the Fukushima accident and considering the available waste storage capacity in the United States, it is unreasonable to think that state and local government agencies would be able to address this significant issue without assistance from the federal government.

Further, nuclear power plants are licensed by the NRC and states have little to no regulatory authority over radioactive materials, reactor fuel and spent fuel. Long term storage and disposal of high level radioactive waste from fixed nuclear facilities is the responsibility of the DOE. Weapons material and waste is a responsibility of the DoD and therefore, any contaminated waste generated by the use of an IND ought to be the property and responsibility of the DoD. Material and waste generated as part of a terrorist act may be considered evidence subject to control by federal law enforcement agencies. In evaluating the regulatory agencies and authorities for radioactive materials, it is inconceivable how EPA can consider radioactive waste solely a state and local issue.

In the United States, there is a significant issue regarding long term radioactive waste storage and the construction of a suitable site for a high level radioactive waste repository. Further, current storage facilities that accept low level radioactive waste have severely limited capacity in light of the waste that would be generated by a large scale nuclear event. With these considerations in mind, it is unreasonable to think that state and local governments would be able to site, construct and license a radioactive waste storage facility within state borders in sufficient time to be effective for the response. For states with high population densities, it may very well be impossible to site such a facility at all. Forlarge radiological events, it is likely that contamination will cross jurisdictional boundaries between states and perhaps even international borders. As one example, an Improvised Nuclear Device could be detonated by international terrorists and affect multiple states. The CRCPD and its members believe that the Federal Government bears the responsibility of protecting national security and as such bears the responsibility for waste disposal that would result from such acts.

A large release could lead to low-level waste volumes that are impossibile to store realistically. Standards need to be developed that ensure that the amount of low level waste generated can be accommodated at existing low level waste storage facilities. The states are not looking for theoretical solutions but practical and realistic solutions. The waste issue cannot be adequately addressed until cleanup criteria and disposal facilities are balanced. The EPA needs to have a more realistic approach to radiological waste disposal that identifies the resolution to the problem and establishes the challenge of radioactive waste disposal/management from a radiological disaster as a joint federal, state and local responsibility.

ATTACHMENT 2

ADDITIONAL COMMENTS FROM CRCPD
Manual of Protective Action Guides

Chapter 1

1. Table 1-1. Planning Guidance and Protective Action Guides for Radiological Incidents

The Early Phase of this Table lists the administration of prophylactic drug KI as a Protective Action Recommendation. The decision to stockpile and distribute KI to the public is a state and local decision and not all jurisdictions have decided to provide KI as part of their response. In order that the Administration of KI is not confused with other Protective Action Recommendations, it is recommended that it be considered a supplemental action for the public and not listed within this table. However, if the intent here is for the protection of emergency workers, it should be stated as such.

2. Page 9, 4th Paragraph

…(as in the case of an accident at an NPP)…

Changed to

…(as in the case of an accident at a NPP)…

3. Page 9, 4th Paragraph

The discussion of the late phase of an emergency introduces new terminology to the EPA document. The term "Reoccupancy" is introduced to describe what has been referred to in the past as "Return". If it is the intent of the EPA to introduce this term as the acceptable language for that action, it should be noted in **BOLD** and included in the glossary. It should also be noted within the text what term it will be replacing for clarity.

4. Page 9, Last Paragraph

The EPA is seeking input on the appropriateness of developing a short-term emergency water PAG. In Attachment 1 of this document, the CRCPD provided discussion regarding the development of a drinking water PAG. It would be appropriate to include that discussion here in the document and remove the final paragraph if the EPA accepts the suggestion.

5. Page 10, First Paragraph

The discussion within this relates to the National Primary Drinking Water Regulation. The regulatory standard of 4 mRem/year based on lifetime exposure is provided. It would be of greater value to have the assumptions for the standard more clearly defined here so that decision makers can better understand the application of this standard. It should clearly state here or, if appropriate, in other sections related to drinking water exactly what time frames (70 years) consumption (liters per day), mitigation strategies (none) etc. are used to calculate that value.

6. Page 10, Final Paragraph

The discussion of the late phase includes the following statement:

"The cleanup process described in Chapter 4, however, does not rely on and does not affect any authority, including the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), 42 U.S.C. 9601 et seq. and the National Contingency Plan (NCP), 40 CFR Part 300."

The intent and interpretation of this statement is unclear. Should we assume that, if during the late phase, a state chooses a clean-up value that is greater than the CERCLA standards, that EPA would exercise its authority to block this action? The intent of this statement needs to be more clearly defined.

Chapter 2

1. Page 16, Section 2.3.1

Spelling question. There are two different spellings within the paragraph for the same word: colocate and collocate. EPA can decide what is best but for the meaning and intent of the discussion it is found, co-locate would likely be the best spelling.

2. Page 17, Section 2.3.2

While the general discussion provides good information, the NRC/FEMA released an updated version of NUREG-0654, Supplement 3 that provides certain specific scenarios for Nuclear Power Plants where shelter in place for close in populations, followed by evacuation once other populations are evacuated, affords a dose reduction. This is referred to as staged evacuation. It might be worth at least acknowledging this within this document for consistency.

3. Page 17, 6th Bullet

- If a major release of radioiodine or particulate materials occurs, inhalation dose may be a controlling criterion for protective actions

The EPA has made the decision to remove the Thyroid dose from consideration for evacuation with a reasonable explanation. However, if the EPA believes that thyroid dose from inhalation can still be a controlling factor for Protective Actions then it should remain. We recognize that the committed dose to the thyroid (organ) and the inhalation dose to the lung from inhalation are separate calculations. However, unless there is an explanation of how it can be controlling for one (lung) and not for another (organ) will be difficult to justify the elimination of the PAG for the thyroid.

4. Table 2-6, Page 31

Are the levels indicated in this table consistent with FEMA guidance for NPPs? This should be checked for consistency.

Chapter 3

1. Page 35, 2nd Paragraph

The concept of "Avoided Dose" is introduced here in the document. The concept of avoided dose is not well understood nor clearly discussed in any other federal guidance document. It would be beneficial to users of this manual and to promote consistency in its application if there were a section within the document that discussed "avoided dose" and how that applies to decision making about PAGs. Terry Kraus (DOE) provided a good overview of the subject at the 2013 Annual Meeting of the Advisory Team. He can provide a good discussion of the topic if EPA believes that the discussion is appropriate for this document. The CRCPD believes that it would be useful.

2. Page 38, 3rd Bullet, Section 3.3.2

- People who were previously evacuated, but reside outside the relocation area and may now return home. A gradual return is recommended.

Since the discussion of this Chapter is for the Intermediate Phase and is limited in scope to the assessment and actions for relocation and dose reduction, the bullet that discusses return or "reoccupancy" is probably inappropriate for this section. While there is agreement that the Intermediate and Late Phases will overlap, in certain circumstances quite considerably, return discussions should be limited to Late Phase actions. It is appropriate for decision makers during this phase to concentrate on protective actions that will further reduce public exposure from residual contamination, from ingestion of contaminated food, water and milk and dose reduction from mitigation strategies. Including return considerations in this section may refocus efforts away from assessment of public health impacts.

3. See Attachment 1 for discussion and comments on the development of Water PAGs

Chapter 4

1. See Attachment 1 for a more detailed discussion of Late Phase Actions and Clean-up standards.

2. The document fails to discuss the turnover process from DOE to EPA for environmental monitoring and assessment. For the late phase discussion in Chapter 4, it is unlikely that the ICS/NIMS structure will remain in place for extended periods of time as assets are no longer required and appropriate controls are in place. We believe that more consideration be given to what the structure for command, control and decision making will look like over time. While there may still be elements in place, there will likely be significant changes over time.

3. While there is a great deal of discussion regarding waste, this document needs to recognize that the responsibility for waste does not fall to state and local government agencies. This is an impossible task for the federal government to tackle for the long term storage of waste, let alone the substantial quantities that will be generated following a large scale radiological incident. More consideration needs to be given to this section. At the very least it should clearly state that radioactive waste following an incident will be shared among state and federal agencies.

"Kathy Burns" <kmb@sciencecorps.org>
09/16/2013 05:38 PM

To: Group A-AND-R-DOCKET@EPA, Gina McCarthy/DC/USEPA/US@MSO365
cc:
bcc:
Subject: Resubmission - correction to docket number

3 attachments

Docket EPA-HQ-AOR-2007-0268.doc
Fundamental Flaws of Hormesis for Public Health Decisions in EHP 2005.pdf
Hormesis in Occ jnl.pdf

The docket number in the e-mail below sent at 4:38 should read EPA-HQ-OAR-2007-0268. Please direct this to the correct docket. Thanks.

From: Kathy Burns [mailto:kmb@sciencecorps.org]
Sent: Monday, September 16, 2013 4:38 PM
To: 'a-and-r-docket@epa.gov'; 'mccarthy.gina@epa.gov'
Cc: Michael Harbut (M1har@aol.com); James Huff (huff1@niehs.nih.gov); Ron Melnick
Subject: Docket ID No. EPA-HQ-OAE-2007-0268

September 16, 2013

To: US EPA Air and Radiation Docket, Washington, DC 20460
Conveyed via e-mail to: *a-and-r-docket@epa.gov* ; *mccarthy.gina@epa.gov*

Re: Docket ID No. EPA-HQ-OAR-2007-0268 regarding "Proposed guidance "PAG Manual: Protective Action Guides (PAGs) and Planning Guidance for Radiological Incidents"

To: Ms. Regina McCarthy, Administrator, US EPA

We oppose weakening radiation protection guidance in the PAG Manual and related policy actions. We urge you to avoid any reliance on concepts that do not adequately consider the range of susceptibilities inherent in populations and the need to strive for de minimis risk in all agency policies. We are submitting two peer-reviewed journal article that demonstrate fallacies inherent in the hormesis hypothesis in public health policy formulation and suggest a review of the many other journal articles that provide a critical review of this hypothesis.

Respectfully submitted,

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Michael R. Harbut, MD, MPH, FCCP
Professor of Internal Medicine Director, Environmental Cancer Program, Karmanos Cancer Institute, Wayne State University,
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James Huff, Ph.D.
Former Chief IARC Monograph Program & Associate Director for Carcinogenesis at the National Toxicology Program, NIEHS (retired).
Research Triangle Park, NC,

Ronald Melnick, Ph.D.
National Toxicology Program, NIEHS (retired) and Ronald Melnick Consulting, LLC
New Haven, Connecticut.

A copy of this e-mail is attached in Word format for your convenience.

PILGRIM WATCH COMMENT PAG MANUAL MARCH 2013 DRAFT FOR INTERIM USE AND PUBLIC COMMENT

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July 9, 2013

TABLE CONTENTS

PILGRIM WATCH COMMENT PAG MANUAL (MARCH 2013) DRAFT FOR INTERIM USE AND PUBLIC COMMENT [Docket ID No. EPA-HQ-OAR-2007-0268]

July 9, 2013

I. INTRODUCTION

EPA's Draft PAG provides radiological protection criteria (PAGs and protective actions) for application to all incidents that would require consideration of protective actions, with the exception of nuclear war.

The PAG says that the "PAGs are not legally binding regulations or standards and do not supersede any environmental laws." However state and local responders treat the Manual as the Gospel and this should be recognized.

The Draft PAG Manual should make clear, but does not, what specific regulations or standards require beside the PAG Manual Guidance. A simple table should be included in the final document laying out side by side the PAGs and all other pertinent standards, as opposed to only footnotes providing links to those standards, as in the draft.

The PAG Manual divides into three sections: Early Phase Protective Action Guides; Intermediate Phase Protective Action Guides; and Late Phase Protective Action Guides. EPA's draft largely provides simply a broad-brushed description of radiological emergency plans at each stage; and not enough attention is given to what the plans <u>should be</u> in order to reflect lessons learned from Fukushima and to protect public health and the environment. The EPA Draft Manual guidance is inadequate in the following areas.

- Meteorological plume modeling, real-time offsite radiological air monitors, environmental sampling
- Dose Guidance
- Potassium Iodide
- Cleanup

II. METEOROLOGICAL PLUME MODELING; REAL-TIME OFFSITE RADIATION/METEOROLOGICAL AIR MONITORING STATIONS; ENVIRONMENTAL SAMPLING - EARLY, INTERMEDIATE, LATE PHASE PROTECTIVE ACTION GUIDANCE

The PAG Manual provides radiological protection criteria for application to all incidents that would require consideration of protective actions. In order to make the correct protective action call (evacuate, shelter, administration KI, interdiction of food/milk/water) and properly assess what areas require cleanup and population relocation requires:

- advanced and site-appropriate meteorological plume models;
- the availability of real -time meteorolo gical/radiological monitors located in the near and far field; and
- Timely and reliable environmental monitoring.

The PAG Draft Manual does not, as it should provide proper specific guidance in these three areas.

A. Meteorological Plume Modeling- Outdated Gaussian Model v. Advanced Variable Models

The EPA Draft PAG missed the opportunity to plainly state that advanced meteorological models[1] should be used. The draft dances around the issue but never comes straight out with a definite recommendation, as it should in the final PAG Manual.

a. Today, the out -dated straight-line Gaussian plume is used by licensees and federal/state emergency planners. It will not provide the information required to make correct protective action decisions. The Gaussian plume model assumes that a release d radioactive plume travels in a steady-state straight-line, i.e., the plume functions much like a beam from a flashlight. The choice of a straight -line Gaussian plume rather than a variable trajectory model drastically reduces, to a wedge, the size of th e area that might potentially be impacted by a release. It has been known by government and independent agencies for a long time that the assumption of a steady-state, straight -line plume is inappropriate when complex inhomogeneous wind flow

[1] See Draft PAG at, fr example pgs., 13,21,22,23,24,37,40

patterns happen to be prevailing in the affected region – such as in hilly and mountainous terrain, along rivers that channel the plume and along wide bodies of waters where, for example, the sea breeze effect occurs.

Sea breeze : There is a misconception that the sea b reeze is generally a highly beneficial phenomenon that disperses and dilutes the plume concentration and thereby lowers the projected doses downwind from the release point. However, if the same meteorological conditions (strong solar insolation, low synoptic-scale winds) that are conducive to the formation of sea breezes at a coastal site occurred at a non coastal location, the resulting vertical thermals developing over a pollution source would carry contaminants aloft. In contrast, at a coastal site, th e sea breeze draws contaminants downward across the land and inland subjecting the population to larger doses and at greater distance.

Behavior Plumes over Water : Also Planning should, but does not, reflect understanding of the flow of air over and arou nd large bodies of water. As an example at Pilgrim, located on New England's Coastline, winds initially headed out to sea will remain tightly concentrated due to reduced turbulence over water until the winds blow the puffs back over land. [2] This can lead to hot spots of radioactivity in unexpected places – beyond 10 miles that should be instructed and prepared to take protective actions.

Meteorological Modeling: Government and Independent Studies

EPA has been a leader in advanced meteorological studies. Al so other government and independent studies support that a straight line Gaussian plume model cannot account for the effects of complex terrain on the dispersion of pollutants from a source. Therefore the final EPA PAG should make this clear – not simply ignore or skirt the issue.

[2] Zager M, Tjernstrom M, Angevine W. 2004, New England coastal boundary layer modelin g. In: AMS 16 th Symposium on boundary Layers and Turbulence, August 2004, Portland, Maine. Angevine WM. Tjernstrom M, Senff CJ, White AB. 2004. Coastal Boundary layer Transport of urban pollution in New England In: 16th Symposium of boundary layers and tur bulence Portland, Maine, 13 th Symposium on Turbulence and diffusion, August 2004, Portland, Maine. Angevine WM. Tjernstrom M, Zager M. 2006. Modeling of the Coastal Boundary Layer and Pollutant Transport in New England, J. of Appl. Meteorol. & Climatol. 4 5: 137-154. Scire JS, Strimaitis DG, Yamatino RJ. 2000 A User's Guide for the CALPUFF Dispersion Model (Version 5). Concord MA: Earth Tech, Inc.

EPA

EPA recognized the need for complex models. For example: EPA's 2005 Guideline on Air Quality Models says in Section 7.2.8 *Inhomogenous Local Winds* that,

> In very rugged hilly or mountainous terrain, along coastlines, or near large land use variations, the characterization of the winds is a balance of various forces, such that the assumptions of steady-state straight line transport both in time and space are inappropriate. (Fed. Reg., 11/09/05).

EPA goes on to say that, "In special cases described, refined trajectory air quality models can be applied in a case-by-case basis for air quality estimates for such complex non-steady-state meteorological conditions." This EPA Guideline also references an EPA 2000 report, *Meteorological Monitoring Guidance for Regulatory Model Applications,* EPA-454/R-99-005, February 2000. Section 3.4 of this Guidance for coastal locations, discusses the need for multiple inland meteorological monitoring sites, with the monitored parameters dictated by the data input needs of particular air quality models.

Most important, EPA's November 2005 Modeling Guideline (Appendix A to Appendix W) lists EPA's "preferred models" and the use of straight line Gaussian plume model, called ATMOS, is not listed. Sections 6.1 and 6.2.3 discuss that the Gaussian model is not capable of modeling beyond 50 km (32 miles) and the basis for EPA to recommend CALPUFF, a non-straight line model.[3]

NRC

Since the 1970s, the USNRC too has historically documented advanced modeling technique concepts and potential need for multiple meteorological towers appropriately located in offsite communities, especially in coastal site regions. But ignored implementing its' own advice.

[3] http://www.epa.gov/scram001/guidance/guide/appw_05.pdf

In 2009, the NRC made a presentation to the National Radiological Emergency Planning Conference;[4] and although it was focused on emergency planning, the content is equally relevant to meteorological modeling for consequence analysis. The presentation concluded that the straight-line Gaussian plume models cannot accurately predict dispersion in a complex terrain and are therefore scientifically defective for that purpose [full presentation is available at ML091050226, ML091050257, and ML091050269 (page references used here refer to the portion attached, Part 2, ML091050257). Exhibit 19

Most reactors, if not all, are located in complex terrains, including Pilgrim. In the presentation, NRC said that the "most limiting aspect" of the basic Gaussian Model, is its "inability to evaluate spatial and temporal differences in model inputs" [Slide 28]. Spatial refers to the ability to represent impacts on the plume after releases from the site e.g., plume bending to follow a river valley or sea breeze circulation. Temporal refers to the ability of the model to reflect data changes over time, e.g., change in release rate and meteorology [Slide 4].

Because the basic Gaussian model is non-spatial, it cannot account for the effect of terrain on the trajectory of the plume – that is, the plume is assumed to travel in a straight line regardless of the surrounding terrain. Therefore, it cannot, for example, "'curve' a plume around mountains or follow a river valley." NRC 2009 Presentation, Slide 33. Entergy acknowledges that within 50-miles from Pilgrim there are hills and river valleys. Further it cannot account for transport and diffusion in coastal sites subject to the sea breeze. Sea breeze also applies to any other large bodies of water. The sea breeze causes the plume to change direction caused by differences in temperature of the air above the water versus that above the land after sunrise. If the regional wind flow is light, a circulation will be established between the two air masses. At night, the land cools faster, and a reverse circulation (weak) may occur [Slide 43]. Turbulence causes the plume to be drawn to ground level [Slide 44].

The presentation goes on to say that, "Additional meteorological towers may be necessary to adequately model sea breeze sites" [Slide 40].

[4] What's in the Black Box Known as Emergency Dose Assessment (ML091050226), 2. Dispersion (ML091050257), 3. Dose Calculation (ML091050269), 2009 National Radiological Emergency Planning Conference, Stephen F. LaVie

Significantly, the NRC 2009 Presentation then discussed the methods of more advanced models that *can* address terrain impact on plume transport, including models in which emissions from a source are released as a series of puffs, each of which can be carried separately by the wind, (NRC 2009 Presentation Slides 35, 36). This modeling method is similar to CALPUFF. Licensees are not required, however, to use these models in order to more accurately predict where the plume will travel to base either consequence analyses or protective action recommendations.

The NRC recognized as early as 1977 that complex terrain presented special problems that a model must address if the air dispersion analysis is to be accurate.[5] For example: NRC, Regulatory Guide 1.111, *Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light-Water-Cooled Reactors* (July 1977) (Draft for Comment) says that, "Geographic features such as hills, valleys, and large bodies of water *greatly* influence dispersion and airflow patterns. Surface roughness, including vegetative cover, affects the degree of turbulent mixing." (Emphasis added).

<u>This is not new information; knowledge of the inappropriateness of straight-line Gaussian plume in at complex sites goes back a long way within NRC. For example:</u>

1972: NRC Regulatory Guide 123 (Safety Guide 23) On Site Meteorological Programs 1972, states that, "at some sites, due to complex flow patterns in non-uniform terrain, additional wind and temperature instrumentation and more comprehensive programs may be necessary."

1977: NRC began to question the feasibility of using straight line Gaussian plume models for complex terrain. *See* U.S.NRC, 1977, Draft for Comment Reg. Guide 1.111 at 1c (pages 1.111-9 to 1.111-10)

1983: In January 1983, NRC Guidance [NUREG-0737**,** Supplement 1 "Clarification of TMI Action Plan Requirements," January 1983 Regulatory Guide 1.97 - Application to Emergency Response Facilities; 6.1 Requirements], suggested that changes in on-site meteorological monitoring systems would be warranted if they have not provided a reliable indication of monitoring conditions that are representative within the 10-mile plume exposure EPZ.

[5] Ibid

1996: The NRC acknowledged the inadequacy of simple straight -line Gaussian plume models to predict air transport and disper sion of a pollutant released from a source in a complex terrain when it issued RTM -96, *Response Technical Manual,* which contains simple methods for estimating possible consequences of various radiological accidents. In the glossary of that document, the NR C's definition of "Gaussian plume dispersion model" states that such models have important limitations, including the inability to "deal well with complex terrain." NUREG/BR-0150, Vol.1 Rev.4, Section Q; ADAMS Accession Number ML062560259,

2004: A NRC rese arch paper, *Comparison of Average Transport and Dispersion Among a Gaussian, A Two- Dimensional and a Three -Dimensional Model*, Lawrence Livermore National Laboratory, October, 2004 at 2. ("Livermore Report") had an important caveat added to the Report's summary about the scientific reliability of the use of a straight -line Gaussian model in complex terrains:

> . . . [T]his study was performed in an area with smooth or favorable terrain and persistent winds although with structure in the form of low -level noc turnal jets and severe storms. In regions with *complex terrain* , particularly if the surface wind direction changes with height, *caution should be used.* Livermore Report at 72 (Emphasis added)

2005: In December, 2005, as part of a cooperative program betwe en the governments of the United States and Russia to improve the safety of nuclear power plants designed and built by the former Soviet Union, the NRC issued a Procedures Guide for a Probabilistic Risk, related to a Russian Nuclear Power Station. The Guid e, prepared by the Brookhaven National Laboratory and NRC staff, explained that atmospheric transport of released material is carried out assuming Gaussian plume dispersion, which is "generally valid for flat terrain." However, the Guide the caveat that in "specific cases of plant location, such as, for example, a mountainous area or a valley, more detailed dispersion models may have to be considered." *Kalinin VVER -1000 Nuclear power Station Unit 1 PRA, Procedures Guide for a Probabilistic Risk Assessment,* NUREG/CR- 6572, Rev. 1 at 3 -114; excerpt attached as Exhibit 8, full report available at http://www.nrc.gov/reading-rm/doc-collections/nuregs/contract/cr6572. Exhibit 20

2007: NRC revised their Regulatory Guide 1.23, Meteorological Monitoring Programs for Nuclear Power Plants. On page 11, the section entitled *Special Considerations for Complex Terrain Sites* says that, "At some sites, because of complex flow patterns in nonuniform terrain, additional wind and temperature instrumentation and more comprehensive programs may be necessary. For example, the representation of circulation for a hill-valley complex or a site near a large body of water may need additional measuring points to determine airflow patterns and spatial variations of atmospheric stability. Occasionally, the unique diffusion characteristics of a particular site may also warrant the use of special meteorological instrumentation and/or studies. The plant's operational meteorological monitoring program should provide an adequate basis for atmospheric transport and diffusion estimates within the plume exposure emergency planning zone [i.e., within approximately 16 kilometers" (10 miles)].[6]

These excerpts from Regulatory Guide 1.23 demonstrate that the NRC recognizes there are certain sites, such as those located in coastal areas, like Pilgrim, that multiple meteorological data input sources are needed for appropriate air dispersion modeling. Not simply one or two meteorological towers onsite. Since the straight-line Gaussian plume model is incapable of handling complex flow patterns and meteorological data input from multiple locations, Regulatory Guide 1.23 demonstrates NRC's recognition that it should not be used at any site with complex terrain.

DOE

DOE, too, recognizes the limitations of the straight-line Gaussian plume model. They say for example that Gaussian models are inherently flat-earth models, and perform best over regions of transport where there is minimal variation in terrain. Because of this, there is inherent conservatism (and simplicity) if the environs have a significant nearby buildings, tall vegetation, or grade variations not taken into account in the dispersion parameterization.[7]

[6] For example, if the comparison of the primary and supplemental meteorological systems indicates convergence in a lake breeze setting, then a "keyhole" protective action recommendation (e.g., evacuating a 2-mile radius)
[7] the MACCS2 Guidance Report June 2004 Final Report, page 3-8:3.2 Phenomenological Regimes of Applicability

National Research Council

Tracking and Predicting The Atmospheric Dispersion of Hazardous Material Releases Implications for Homeland Security, Committee on the Atmospheric Dispersion of Hazardous Material Releases Board on Atmospheric Sciences and Climate Division on Earth and Life Studies, National Research Council of the National Academies, 2003. The report discusses how the analytical Gaussian models were used in the 1960s and tested against limited field experiments in flat terrain areas performed in earlier decades.

In the 1970s the US passed the Clean Air Act which required the use of dispersion models to estimate the air quality impacts of emissions sources for comparison to regulatory limits. This resulted in the development and testing of advanced models for applications in complex terrain settings such as in mountainous or coastal areas. In the 1980s, further advances were made with Lagrangian puff models and with Eulerian grid models. Gaussian models moved beyond the simple use of sets of dispersion coefficients to incorporate Monin-Obukhov and other boundary layer similarity measures which are the basis of contemporary EPA models used for both short range and long range transport applications. Helped enormously by advances in computer technologies, in the 1990s, significant advances were made in numerical weather prediction models and also further improve dispersion models through the incorporation of field experiment results and improved boundary layer parameterization. The decade starting with the year 2000 has seen improved resolution of meteorological models such as MM5 and the routine linkage of meteorological models with transport and dispersion models as exemplified by the real time forecasts of detailed fine grid weather conditions available to the public at Olympic events. Computational Fluid Dynamics (CFD) models which involve very fine grid numerical simulations of turbulence and fluid flow began to see applications in atmospheric dispersion studies. The next decade will see routine application of CFD techniques to complex flows associated with emergency response needs.

The nuclear industry does not show evidence of keeping up with these technological advances. For use in modeling air quality concentrations, the NRC uses straight-line Gaussian dispersion algorithms that date back to the 1960s. EPA should, but does not, advocate in the draft keeping up with these technological advances. Complex flow situations such as those associated with flow around high terrain features or that would incorporate sea breeze circulations are not simulated. For emergency response applications, the EPA, unlike NRC, should be advocate of advanced modeling to be installed at nuclear power plants.

Atmospheric Scientists & Meteorologists

For over three decades atmospheric sci entists and meteorologists have been identifying problems in the use of models similar to ATMOS for such settings. Example: Steven R. Hanna, Gary A. Briggs, Rayford P. Hosker, Jr., National Oceanic and Atmospheric Administration, Atmospheric Turbulence an d Diffusion Laboratory, *Handbook on Atmospheric Diffusion* (1982)).

The inability of a simple Gaussian plume model to accurately predict air transport and dispersion in complex terrains is such a basic flaw that it is discussed in a textbook for a college - level introductory course in environmental science and engineering (Steven R. Hanna, Gary A. Briggs, Rayford P. Hosker, Jr., National Oceanic and Atmospheric Administration, Atmospheric Turbulence and Diffusion Laboratory, *Handbook on Atmospheric Diffusion* (1982)). (Chapter 13 authored by William J. Moroz). In listing the assumptions that are made to develop a simple straight line Gaussian plume model, the textbook warns that:

The equation is to be used over relatively flat, homogeneous terrain. It should not be used routinely in coastal or mountainous areas, in any area where building profiles are highly irregular, or where the plume travels over warm bare soil and then over colder snow or ice covered surfaces

B. Real-Time Offsite Radiation/Meteorological Air Monitoring Stations

The EPA Final PAG needs to emphasize in clear language the need for robust real -time monitoring data to help address the question of what was emitted, over what timeframe, where it went thereafter, and what did it do or not do to the surrounding public. The importance is threefold:

(1) <u>Fore-casting</u> (ahead of time, as a tool for emergency planning tool for pre -planning). Where would a plume likely go under various typical weather regimes, and what and where could be the resultant concentrations/potential doses?

(2) Now-casting (during a radiological emergency). Where is the plume actually going, and what are the resultant concentrations/potential doses - for making appropriate recommendations (i.e., evacuate or shelter in place)?

(3) Hind-casting (the post -radiological emergency timeframe) – Combining meteorological modeling with expanded meteorological/radiological data to provide for more accurate/realistic dose estimates can help with disaster recovery, clean -up, litigation resolution, and short -term acute and long-term epidemiological health studies.

Multiple Meteorological Towers Importance Recognized Since the 1970's

Since the 1970s, the USNRC has historically documented all the advanced modeling technique concepts and pote ntial need for multiple meteorological towers especially in coastal regions. NRC Regulatory Guide 123 (Safety Guide 23) On Site Meteorological Programs 1972, states that, "at some sites, due to complex flow patterns in non -uniform terrain, additional win d and temperature instrumentation and more comprehensive programs may be necessary]; and an EPA 2000 report, Meteorological Monitoring Guidance for Regulatory Model Applications, EPA-454/R-99-005, February 2000, Sec 3.4 points to the *need for multiple inla nd meteorological monitoring sites*. See also Raynor, G.S.P. Michael, and S. SethuRaman, 1979, Recommendations for Meteorological Measurement Programs and Atmospheric Diffusion Prediction Methods for Use at Coastal Nuclear Reactor Sites. NUREG/CR-0936.

C. Environmental Sampling/Monitoring

The Draft PAG recognizes that dose projections are useful for initiating protective actions in the early phase but there is uncertainty prior to confirmatory field measurements because of unknown factors affecting environme ntal pathways, inadequacies of modeling and uncertainty in the data for release terms. (Draft, pg., 22) However what is not acknowledged are the limits of field measurements due to lack of funds and sufficient staff to perform the field measurements in a timely manner. Also the PAG does not indicate specifics such as how deep in the soil samples should be taken nor how often the samples should be repeated in the same area to account for resuspension or aqueous discharges and runoff.

III. PLANNING GUIDANCE AND PAGS (DRAFT, PG., 7)

Decisions regarding protective actions depend on dose response guidance. Whether the dose-response guidance is based on the best science on radiation health effects available today will determine whether the protective actions are protective of human health. Unfortunately the Draft PAGS are based on old science and out-of-date meaning the public will be harmed unnecessarily not protected.

Pilgrim Watch incorporates herein the testimony in full presented by Dr. Daniel Hirsch, Committee to Bridge the Gap, California. Highl ights of what is wrong with the PAGS and how EPA is abdicating its responsibility to protect public health include, for example:

1. EPA eliminates the existing requirements from the 1992 PAGs triggering evacuation when thyroid or skin doses exceed specified limits.
2. EPA eliminates the existing relocation limit of 5 rem cumulative dose over 50 years, saying it might conflict with their long -term cleanup approach, which in the new associated guidance from NCRP would allow cumulative 50 -year doses of 100 rem, twenty-fold higher. Even thirty years exposure at the 2 rem/year figure would, by EPA's own official risk estimates, result in an excess cancer in every eighth person exposed ; orders of magnitude higher risk than EPA has ever considered acceptable.
3. EPA incorrectly argues that relaxed long-term standard is somehow justified because the public's exposure will not be for 70 years. But this is a disingenuous argument. The core of the long-term cleanup part of the PAGs is setting a very high permissible annual dose that one would be allowed to get for a whole lifetime (indeed, the standard 70 year lifetime assumption) without the government having to cleanup at all. The one-year exposure is for the intermediate phase; the long-term phase is forever, and that is what is so troubling about relaxing long-term cleanup standards.
4. EPA says that the Safe Drinking Water Act Maximum Contaminant Limits (MCLs) may not be appropriate and propose five alternatives far more lax , and does so in footnotes. Those proposed weaker l imits would allow concentrations of radionuclides in drinking water orders of magnitude higher than considered safe by EPA under the Safe Drinking Water Act. I have attached two tables Dr. Hirsch put together comparing these levels for four key radionucli des. Their proposals are frequently as bad as the Bush water PAG

proposal and in some cases worse. Generally, they are proposing allowing hundreds to tens of thousands of times higher concentrations of radioactivity in drinking water than EPA has historically allowed as safe under the Safe Drinking Water Act.

Obama Drinking Water PAG proposals vs. Existing EPA Safe Drinking Water Levels and Bush Administration PAG Proposal
units = Bq/L

Radionuclide	EPA Safe Drinking Water Act Maximum Contaminant Limit (MCL)	Bush Proposed Drinking Water PAG	Obama Proposed Drinking Water Page Alternative I (EPA 2013 fn 26)	Obama Proposed Drinking Water PAG Alternative II (EPA 2013 PAG fn 25)	Obama Proposed Drinking Water PAG Alternative III (EPA 2013 PAG fn 27)	Obama Proposed Drinking Water Alternative IV (EPA 2013 PAG fn 24a)	Obama Proposed Drinking Water Alternative V (EPA 2013 PAG fn 24b)
Iodine-131	0.111	314	314	3000	170	10	300
Strontium-90	0.296	246	246	200	160	10	
Cesium-137	7.4	503	503	2000	1200	10	
Plutonium-239	0.555	27	27	50	2	1	

Factors by Which Obama Drinking Water PAG Proposals Would Exceed Existing EPA Safe Drinking Water Levels

Radionuclide	Bush Proposed Drinking Water PAG	Obama Proposed Drinking Water Page Alternative I (EPA 2013 fn 26)	Obama Proposed Drinking Water PAG Alternative II (EPA 2013 PAG fn 25)	Obama Proposed Drinking Water PAG Alternative III (EPA 2013 PAG fn 27)	Obama Proposed Drinking Water Alternative IV (EPA 2013 PAG fn 24a)	Obama Proposed Drinking Water Alternative V (EPA 2013 PAG fn 24b)
Iodine-131	2829	2829	27027	1532	90	2703
Strontium-90	828	828	676	541	34	
Cesium-137	68	68	270	162	1.35	
Plutonium-239	49	49	90	3.6	1.8	

Note: Second vertical column, "Obama proposed Drinking Water Page" should read PAGs not Page

5. EPA incorporates 1998 guidance allowing extremely high contamination of food, despite internal EPA criticism of doing so which said it would produce a cancer in every fiftieth person so exposed.
6. EPA incorporates the DHS PAGs for dealing with long-term cleanup from a nuclear weapons explosion and applies it to any kind of release. The DHS PAG is based on "optimization" and contemplated permitting long-term doses as high as several rem per year. The new PAG is tied to the NCRP new guidance which would allows doses up to 2 rem per year over a lifetime (the equivalent of about 1000 extra chest X-rays every year, or 3 X-rays every day of your life from birth to death). EPA's estimate of a 70-year

lifetime exposure at that level would be one in every six people exposed would get a cancer (the risk coefficient they use is different for exposure over a lifetime t han for earlier years because of the elevated risk at younger ages

7. The associated NCRP guidance on implementing the PAGs for long term cleanup recommends radionuclide concentration levels so high that they would allow concentrations for strontium-90, for example, hundreds of thousands of times higher than the EPA's official Preliminary Remediation Goals for the same exposure scenarios. They would produce cancer risks using EPA's risk figures in the several cancers per ten people exposed, orders of magnitude outside the long-held acceptable risk range.
8. In essence, the PAGs and the documents associated with them are saying nuclear power accidents could be so widespread and produce such immense radiation levels that the government would simply abandon most cle anup obligations and force people to live with exposures so high that extremely large fractions of the exposed population would get cancer from the exposure.
9. Troubling in a different fashion, EPA buries the "bad stuff" in footnote references to a whole series of other documents so it is hard for a lay reader to see the troubling things EPA has done. EPA thereby has made the PAG manual itself essentially useless in a real accident. It was supposed to be a stand-alone, clear document that a first-responder could take off the shelf, look up a table in it, see if a radiation level exceeded a PAG and if so undertake the protective action described therein. But all of that is now removed from the PAG document. Instead, there are footnotes to URLs for numerous referenced documents, most of which are contradictory, so that the PAG does not achieve its intention that is to be useful in providing some guidance.

Furthermore, EPA is statutorily mandated to produce the PAGs and other radiation guidance for the rest of the federal family and historically has viewed DOE and NRC as not sufficiently protective in radiation matters. The PAG now abdicates EPA's responsibility to come up with guidance and instead references almost exclusively documents from DOE that EPA has historically opposed. For example, it now directs the use of DOE's Operational Guidance document which uses cleanup concentrations hundreds of thousands of times higher than EPA's official concentrations. Rather than use its own conversions from conce ntration to risk, EPA now defaults to DOE's models, documents, and values with which it has long disagreed as technically not defensible and not sufficiently protective. But at the end of the day, no emergency responder will have a Protective Action Guide that is useable. If it were used, however, it would allow doses to the public so far outside the range ever considered acceptable as to be deeply disturbing.

IV. EARLY PHASE PROTECTION ACTION GUIDANCE

The Draft PAG's guidance is insufficient or incorrect for: dose that triggers evacuation, discussed above; potassium iodide; omission of the importance of stockpiling 3-M face masks; and apparent confusion over the requirement for, and role of, Reception Centers.

Potassium Iodide, KI (Draft Section 2.3.4)

KI is FDA approved: It is stockpiled around the world and recommended by experts such as: the World Health Organization; the National Academies of Sciences [8] that acknowledged KI's efficacy and that it may be necessary beyond 10 -miles; American Thyroid Associati on; the International Atomic Energy Agency; President Carter's Kemeny Commission; Federation of American Physics; U.S. Public Interest Group. Although adverse reactions are possible, but rare, to those allergic to iodine; however, unlike exposures to radia tion, no long term negative effects or fatalities are on record.

Contrary to FDA and the above listed organizations, the EPA PAG improperly blows out of proportion KI's supposed contraindications, indicating a strong bias to discourage its use – politics over science. For example, EPA says that:

> Some people should not take KI . As a rule, individuals with known allergy to iodine or with pre-existing thyroid disease (e.g., Graves' disease, thyroid nodules, Hashimoto's thyroiditis) that might predispose th em to adverse reactions should avoid KI. (Draft, pg., 20)

FDA, in contrast, says that individuals with known allergy to iodine or with pre-existing thyroid disease should be treated with caution; EPA says that they "should avoid KI.

[8] *Distribution and Administration of Potassium Iodide in the Event of a Nuclear Incident,* 2004

KI-Time Sensitive: The Draft EPA Guidance avoided to make clear[9] that because KI is time sensitive, it must be stockpiled ahead of time and taken so that it can be administered at the earliest possible time. The Final PAG needs to correct this omission.

Distance to Stockpile K I: The Draft makes no recommendation or mention of the distance from reactors that KI should be stockpiled. The Bioterrorism Act's Section 127, for example, called for stockpiling KI out to 20 miles from a reactor site. It was never implemented for purely political reasons despite the fact that NRC stockpiles KI for its employees.

The reason to provide KI in the 10 -20 mile zone is because of the possibility of inhalation during an accident of significant consequence. For example, Dr. Temeck (FDA representa tive to NRC's KI Core Group Meeting, Tempe Arizona, March 4, 1999) stated that exposure to children after Chernobyl resulted from "a combination of inhalation and ingestion."

NRC's NUREG-1633 points out that radioactive iodide can travel hundreds of mil es on the winds. An increase in cancer caused by Chernobyl was detected in Belarus, Russia and Ukraine. Notably, this increase, seen in areas more than 150 miles from the site, continues to this day and primarily affects children who were 0-14 years old at the time of the accident…the vast majority of the thyroid cancers were diagnosed among those living more than 31 miles from the site. The 2001 figures showed 11,000 thyroid cancers at 31 miles. Again, "Exposure to children after Chernobyl resulted from "a combination of inhalation and ingestion."

NRC's NUREG/CR 1433 said that for children, the following dangers might occur from the inhalation of nuclear materials after a massive core-melt atmospheric accident (like Chernobyl):

Approximate Dangers of a Core-Melt Atmospheric Accident for Children

Distance in Miles	Mean Thyroid Dose (rem) for Exposed Children Outdoors*	Probability of Thyroid Damage to Exposed Children Located Outdoors if not Protected by Stable Iodine (like KI)
1	26,000	100%
5	11,600	100%

[9] See Draft PAG, for example, at pgs19-20, 33

10	6,400	100%
25	2,200	80%
50	760	26%
100	200	7%
150	72	2%
200	32	1%

Therefore EPA's Final PAG should advocate stockpiling KI to at least 20 miles, and that both the Federal Government [10] and states have KI stockpiles located so as to provi de KI in a timely manner to those without it.

Pilgrim Watch incorporates in full the comments on Potassium Iodide submitted on this docket by Peter Crane, Seattle Washington.

Face Masks

The PAG says that "breathing air filtered through common household it ems (e.g., folded handkerchiefs or towels) may help reduce exposures from contamination on the ground. (General Guidance for Evacuation and Sheltering in pace, pg., 17) Instead, PW recommends that the Final EPA PAG recommends stockpiling face masks in publ ic shelters, schools; and that emergency planners include face masks in their public education literature. The PAGs advice is not practical for school children and the rest of the public for that matter. Imagine a mother leaving a shelter with two small ch ildren to drive to the Reception Center for monitoring, decontamination and relocation instructions. How possibly can she drive and cover her and her children's mouths? Also, masks may be useful inside shelter locations, because shelters cannot be 100% eff ective in eliminating dose. The basic 3-M (N-95) type masks screen out >0.1 microns and are inexpensive. They come in child and adult sizes.

[10] The U.S. Strategic National Stockpile stopped purchasing KI (Washington Post, April 7, 2011)

Reception Centers- Monitoring & Decontamination

Section 2.31 says that "A decontamination Station, with simple d econtamination actions, may need to be collocated at shelters during the pre -evacuation period." The language is confusing for reactor accidents. Radiological emergency plans for nuclear reactors require Reception Centers located outside the EPZ. NUREG -0654, J -12 says that Reception Centers shall monitor 100% of the population within 12 hours. Therefore the Reception Centers must be equipped with sufficient monitors (portal and hand monitors), have capability to decontaminate as required, and provide towe ls and clothing or coveralls for the public to wear after decontamination. The Final PAG must make this clear.

Similarly, Radiological Emergency Workers Monitoring and Decontamination Stations must be located outside the EPZ and equipped to monitor and decontaminate.

Vehicles arriving at the Reception Centers or REWMDS also must be wiped down so as not to spread contamination to clean areas. The PAG is silent on REWMDS.

V. INTERMEDIATE PHASE (CHAPTER 3)

The Draft says that "The principal protective actions fo r reducing exposure of the public to deposited radioactive materials are relocation, decontamination and time limits of exposure."

A. Relocation

The Draft says that relocation should be based on 2 rem (2,000 millirem) over the first year of exposure and afte r the first year, the PAG relocation standard is 0.5 rem (500 millirem). (Draft, pgs., 7, 50)

The PAG **eliminates the existing relocation limit of 5 rem cumulative dose over 50 years, saying it might conflict with their long -term cleanup approach**, which in the new associated guidance from NCRP would allow cumulative 50 -year doses of 100 rem, twenty -fold higher. Even thirty years exposure at the 2 rem/year figure would, by EPA's own official risk estimates, result in an excess cancer in every eighth person exposed; orders of magnitude higher risk than EPA has ever considered acceptable

B. Decontamination & Cleanup

The key points to reduce exposure of the public in both the intermediate and late phase are not properly addressed. They include, for example:

- Meteorological modeling with expanded meteorological/radiological data to provide for more accurate/realistic dose estimates that can help with disaster recovery, clean-up (discussed in the foregoing);
- Capability to decontaminate - hosing buildings and plowing under fields does not decontaminate but simply moves the contamination from one place to another;
- Waste disposal, admitted to be impossible in a severe reactor accident but shifting responsibility to the state and local community is not the answer, either; and
- Updated dose estimates based on BEIR VII and geared to the most vulnerable -women and small children.
- Avoided is a discussion of what federal agency is in charge and who pays.

DECONTAMINATION/CLEANUP- NOT PROPERLY ADDRESSED

The EPA Draft never challenges current NRC/FEMA assumptions reflected in NRC's consequences models that:

- Underestimates both the size of the area likely to be contaminated, and the extent of contamination.
- Underestimates how long cleanup and decontamination will take.
- Ignores that forests, wetlands, and bodies of water essentially cannot be cleaned up or decontaminated and in turn runoff will re-contaminate cleaned areas.
- Ignores that the technologies needed for cleanup have not even been developed.
- Underestimates the huge volume of waste; and slides over the fact that there are no available disposal options.
- Ignores there is not even a clear-cut cleanup standard -guidance not regulation.
- Assumptions are based on estimates of what is required for nuclear weapon cleanup, rather than the very different problems presented by nuclear reactor accident - micron size and volume.

- Minimizes consequences by assuming a straight -line Gaussian plume model, ignoring aqueous discharges, and ignoring that an accident can persist over many weeks and months.
- Underestimates the time that decontamination will take. Technologies to cleanup have not been developed; current cleanup methods used in Japan and assumed in US models do not work- hosing down buildings and plowing under fields. They are based on nuclear weapons cleanup that is a different from cleanup after a nuclear reactor accident. Many radionuclides, like Cs-137, have long half-lives.

The Contaminated Area

The cost of cleanup fundamentally reflects the size of the area contaminated, and t he level of contamination. A year ago, the Japanese press reported that the Fukushima accident contaminated 13,000 square kilometers (an area nearly equivalent to the size of Connecticut (land area and water). The contaminated area extended in all directi ons and at considerable distance from the site. [11] The Japanese Ministry of Education, Culture, Sports, Science and Technology (MEXT) map showed the spread of radiation from Fukushima across 10 prefectures, including Tokyo and Kanagawa. [12] Also so far as Pilgrim Watch (hereinafter "PW") knows, no one has even attempted to calculate how much of the Pacific Ocean and connecting waters have been contaminated by aqueous discharges and those impacts on the size of the area contaminated, impact on cleanup and human health from consuming fish and seafood.

Beyond "how large an area," is the question of "how contaminated?" The level of contamination in the affected areas depends on both the size of the release at any point in time, and also on its duration. The Fukushima release has continued for months.

The basic lesson to be learned from these simple facts is that any r emotely adequate consequence analysis must take into account the very real likelihood of a large level release that

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[11] *Estimated 13,000 square km eligible for decontamination* Asahi.com (Asahi Shimbun), Oct 12, 2011
[12] Mainichi News, http://mdn.mainichi.jp/mdnnews/news/20111007p2a00m0na009000c.html; Gov't radiation info in English http://radioactivity.mext.go.jp/en/

continues for a long period of time and contaminates many thousands of square miles. The EPA Draft and current NRC economic analyses unreal istically limit the duration of the radioactive release, the size of the affected area, and the radiation source.

- Duration: The Fukushima disaster persisted over many months. But the EPA Draft and NRC approved consequence code, MACCS2, limits the total d uration of a radioactive releases to no more than four (4) days, if the user chooses to use four plumes occurring sequentially over a four day period.[13] A longer release such as that at Fukushima will cause offsite consequences that will increase contamination, and result in required re -decontamination, and significantly increase cleanup costs and the overall cost-benefit analyses.
- Size of Affected Area. How large an area will be contaminated, and where that area is likely to be, depends on assumptions made about the radioactive plume. Fukushima showed that the plume did not travel simply in a straight -line.[14] Fukushima also showed that releases can extend for weeks and months and thereby the plumes will travel in variable directions. Rascal also assumes a Gaussian plume in the near field and a segmented Gaussian plume in the far field. This ignores that winds are co mplex and variable near large water bodies, along rivers, and hilly terrain so that a much larger geographic area, in multiple directions, is impacted. EPA needs to incorporate these lessons in the final PAG.
- Non-Atmospheric Releases. Fukushima also showe d that contamination is also spread by aqueous discharges. In Japan enormous quantities of contaminated water flowed into the Pacific Ocean as result of "feed and bleed" and from runoff into groundwater, streams and other water bodies from contaminants deposited by atmospheric releases on land.
- What Can't Be Cleaned -up? Lessons learned from Fukushima show that forests, water and shorelines, for example, cannot realistically be cleaned up and decontaminated. For example the Japan Times reported in September 2011[15] that

> In August, the government acknowledged difficulties in removing soil and ground cover from the forests, due mostly to the volume of radioactive waste that would be generated by the effort.

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[13] NUREG/CR-6613 Code Manual for MACCS2: Volume 1, User's Guide, 2-2
[14] Gov't radiation info in English http://radioactivity.mext.go.jp/en/
[15] Institute probing radioactive contamination of Fukushima forests, Japan Times,, Sep. 17, 2011

> "Huge volumes of soil and other (contaminated) items would be involved because the forests occupy a huge area."
>
> The government effectively shelved any approach to decontaminating forests when it said that removing both the contaminated soil and compost materials would strip the forests of important ecological functions, including water retention.

Real world experience also shows that bodies of water, such as the Pacific, cannot be cleaned up either. Further, ocean currents may re-circulate the contamination for years contaminating and re-contaminating beaches and marine life increasing costs from a continuous need to cleanup and pay for damaged to the environment[16].

Waste Volume and Disposal

Lessons learned from Fukushima show that the Japanese Environment Ministry expects the cleanup to generate at least 100 million cubic meters (130 million cubic yards) of soil, enough to fill 80 domed baseball stadiums. [17]. The Yomiuri Press reported that disposal sites refuse to accept 140,000 tons of tainted waste. [18] Because there is no available storage for the high volume of waste and no community willing to host the disposal site,[19] waste is piling up and run-off from it contaminates and re-contaminates groundwater and property. [20] The problem cannot be solved soon because the technology is not there and cesium-137 takes 30 years to decay one half-life.[21]

The Japanese Government's clean-up budget for the next two years is $14 billion; the NRC's estimate is nowhere near that.

The Draft PAG passes disposal to the states and local communities; and it assumes that cleanup can be quickly accomplished. After Chernobyl, authorities quit trying to clean-up after 4 years.

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[16] Fukushima's radioactive sea contamination lingers, Andy Coghlan, New Scientist, Sept 30, 2011; Radioactive cesium may be brought back by Ocean in 20-30 years, Tokyo Times, 09.16.11
[17] Ibid
[18] *Daily Yomiuri* - Disposal sites refuse to accept 140,000 tons of tainted waste March 4, 2012
[19] Mainichi Press, *Residents near Fukushima mountains face nuclear recontamination every rainfall, October 11. 2011*
[20] Ibid
[21] Ibid

There is no excuse for ignoring waste storage, and Fukushima proved (and continues to prove) that latter is a pipe -dream. Even optimistically assuming an available radi oactive waste repository, it seems unlikely that there would be a sufficient quantity of transport containers, and many communities will quite certainly object to the millions of tons of hazardous materials being transported through them.

The EPA Draft si mply passes the buck. It acknowledges that "incidents that create large volumes of waste from a wide -scale radiological incident would likely overwhelm existing radioactive waste disposal capacity in the U.S." (Draft, pg., 69) Therefore it concludes that, "Following a nuclear incident, the states bear primary responsibility to identify and provide waste management options, including disposal capacity." (Ibid) The Draft incorrectly implies that there can be a solution. It says "safely managing and disposing of radioactive waste will require pre-planning at all levels of government and careful coordination with stakeholders at all stages of the decision-making process." (Ibid) It is time for EPA to pull "their big -boy pants up" and admit there is no solution.

<u>Technologies for Cleanup Not Developed - Current Methods Ineffective</u>

Cleanup methods used in Japan, and assumed in the Draft PAG, do not work. Hosing down buildings and plowing under fields does not remove contamination. It simply moves it to another place, such as the groundwater, to reappear at a later date and require more monies to either start again or bare the cost. For example, plowing will move the radiation to below the root zone for crops or reduce root uptake and food doses to the consumer of such crops. Thus, it cannot be said that the decontamination strategies identified remove the radiation from the environment. Also the fact that cesium is soluble, which means that precipitation events or fire-hosing can actually facilitate cesium binding to structural surfaces or spread it into a community's infrastructure (*e.g.*, sidewalks, gutters, drains, sewer pipes) and ecosystem (*e.g.*, groundwater, streams, lakes, reservoirs).[22] The ability of cesium and other fission products to bind to surfaces is especially pronounced for porous or rough surfaces.[23]

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[22] Chanin, D.; Murfin, W. (1996). *Site Restoration: Estimation of Attributable Costs from Plutonium-Dispersal Accidents*, SAND96-0957, DE9601166, Sandia National Laboratories. Original 300-dpi OSTI version available at: http://chaninconsulting.com/downloads/sand96-0957.pdf (10.4 MB), OCR-readable courtesy S. Aftergood, FAS, E-12.
[23] Ibid, 5-8, E-1, E-3, E-4, E-8, E-11

A reasonable question is why the EPA, FEMA, NRC and Japanese authorities assume hosing and plowing under fields is cleanup. The likely, and unacceptable, answer is that the needed technologies for clean up have not been developed - their development is predicted to be decades down the road - and the that cost of actually removing all of the contamination too big to even think about - far more than the $14 billion budgeted through 2014 by the Japanese government. However, the fact that the cost of any real clean -up is unimaginable is no excuse for the EPA to relax standards and allow folks to stay or move back to their communities.

The Faulty Premise of the Clean-Up Model[24]

Cleanup assumptions are based on WASH-1400; and WASH -1400, that in turn, were based on clean up after a nuclear explosion. Cleanup after a nuclear bomb explosion is not comparable to clean up after a nuclear reactor accident and assuming so will underestimate the task.

Particle Size : N uclear weapon explosions result in larger -sized radionuclide particles; reactor accidents release small sized particles. Decontamination is far less effective, or even possible, for small particle sizes. Nuclear reactor releases range in size from a fracti on of a micron to a couple of microns; whereas nuclear bomb explosions fallout is much larger - particles that are ten to hundreds of microns. These small nuclear reactor releases get wedged into small cracks and crevices of buildings making clean up extrem ely difficult or impossible. Further reactors release Cs-137 that are no only small particles but soluble. Cesium particles are capable of ion exchange with sodium and potassium in materials such as concrete and migrate over time into the interior and cannot be washed off. Plutonium on the other hand is insoluble.

Mass Loading: Nuclear weapon explosions result in fallout involving large mass loading where there is a small amount of radioactive material in a large mass of dirt and demolished material. Only the bottom layer is in contact with the soil and the massive amount of debris could be shoveled, swept up with brooms or vacuums resulting in a relatively effective, quick and cheap cleanup that would not be the case with a nuclear reactors fine particulate . The Japanese are learning this the hard way, as those in Chernobyl before had discovered.

[24] Chanin, D.; Murfin, W. (1996). *Site Restoration: Estimation of Attributable Costs from Plutonium-Dispersal Accidents*, SAND96-0957, DE9601166, Sandia National Laboratories. Original 300-dpi OSTI version; NYS000241, December 21, 2011, Pre-filed written testimony of Dr. Francois J. Lemay, NYS Contention 12-C,

Type Radiation Released : In addition, a weapon explosion results in non -penetrating radiation so that workers only require basic respiration and skin protection. This allows for cleaning up soon after the event. In contrast a reactor release involves gamma radiation and there is no gear to protect workers from gamma radiation. Therefore cleanup cannot be expedited, unless workers health shamefully and unethically i s ignored. Decontamination is less effective with the passage of time.

Clean-up Standard

How clean is clean? The cleanup standard will be determined by what seems possible - how much it will cost and what the public will accept - not, as it should, by public health considerations.

> In the United States, a range of one in a population of ten thousand to one in a population of one million excess cancer incidence outcomes is generally considered protective for both chemical and radioactive carcinogenic cont aminant exposures. The range is the regulatory standard generally used in the context of EPA superfund response actions…A similar range risk may not be practically achievable for major incidents that result in the contamination of very large areas. In maki ng decisions about cleanup goals and strategies for a particular event, decision makers must balance the desired level of exposure reduction with the extent of the measures that would be necessary to achieve it, in order to maximize overall human welfare.
>
> While it may take many years to achieve final cleanup levels, a timely return to normalcy, including re -occupancy and viable community, will require a more flexible, iterative and inclusive. (Draft, pg., 53)

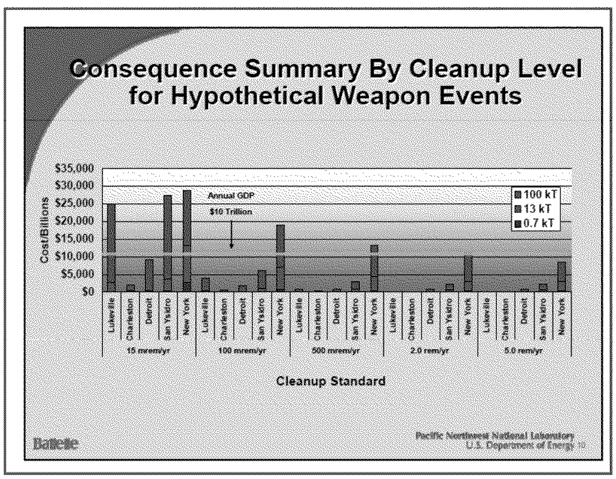
Likewise, firm standards were not pre -set in Ja pan prior to the accident. Real world experience there shows that the public will not tolerate a relaxed standard, unless misled b government agencies. The public expects cleanup to reach pre -accident levels.[25] The same will be true here.

The economic cons equences of a radiological event are highly dependent on cleanup standards and cleanup costs generally increase dramatically for standards more stringent than 500 mrem/yr. This was shown true by two studies commissioned by the US Department of

[25] *In One Japanese City, Hot Spots to Avoid,* Wall Street Journal, Phred Dvorak, Sept 3, 2011

Homeland Security for the economic consequences of a Rad/Nuc attack. Although considerably more deposition would occur in reactor accident, magnifying consequences and costs, there are important lessons to be learned from these studies.

Barbara Reichmuth's study, Ec onomic Consequences of a Rad/Nuc attack: Cleanup Standards Significantly Affect Cost, 2005, [26] Table 1 Summary Unit Costs for D &D (Decontamination and Decommissioning) Building Replacement and Evacuation Costs provides estimates for different types of areas from farm or range land to high density urban areas. Reichmuth's study also points out that the economic consequences of a Rad/Nuc event are highly dependent on cleanup standards: "Cleanup costs generally increase dramatically for standards more stringent than 500 mrem/yr."



A similar study was done by Robert Luna, *Survey of Costs Arising from Potential Radionuclide Scattering Events,*[27] concluded that,

> …the expenditures needed to recover from a successful attack using an RDD type device …are likely to be significant from the standpoint of resources available to local or state governments Even a device that contaminates an area of a few hundred acres (a square kilometer) to a level that requires modest remediation is likely to

[26] Economic Consequences of a Rad/Nuc attack: Cleanup Standards Significa ntly Affect Cost Barbara Reichmuth, Steve Short, Tom Wood, Fred Rutz, Debbie Swartz, Pacific Northwest National laboratory, 2005

[27] Survey of Costs Arising From Potential Radionuclide Scattering Events, Robert Luna, Sandia National laboratories, WM2008 Conference, February 24-28, 2008, Phoenix AZ

produce costs ranging from $1 0M to $300M or more depending on the intensity of commercialization, population density, and details of land use in the area." (Luna, Pg., 6)

In essence, the PAGs and the documents associated with them are saying nuclear power accidents could be so widesp read and produce such immense radiation levels that the government would simply abandon most cleanup obligations and force people to live with exposures so high that extremely large fractions of the exposed population would get cancer from the exposure. He re, EPA's Draft PAG totally abdicates its responsibility to protect public health and the environment, not to mention morality.

C. Drinking Water Standard

The Drinking Water Standard is discussed above, Section II.

VII. LATE PHASE (CHAPTER 4)

There is overlap be tween the intermediate and late phase. In essence, the PAGs and the documents associated with them are saying nuclear power accidents , based on real -world experience in Japan, could be so widespread and produce such immense radiation levels that the government would simply abandon current exposure limits finding them not achievable and advise people to live with exposures so high that exposed population would get cancer from the exposure, especially the most vulnerable- fetus, children, women and the sickly.

The Draft PAG acknowledges that clean -up and decontamination is an enormously expensive job, extending over decades, and the volume and toxicity of wastes from a wide -scale radiological incident is likely to overwhelm existing waste capacity in the U.S. (pgs. 60, 61, 69). Therefore they pass responsibility for the impossible task of dealing with the waste to states; although, the federal government, not the states, have responsibility for assuring the safe operations of nuclear reactors and security. The federal agencies blew it and now the states get responsibility for the "orphaned" waste.

Further the EPA Draft PAG, like NRC, fails to acknowledge that the technology for real cleanup does not exist. As explained, hosing down buildings and plowing under f ields does not clean-up or decontaminate.

Last the section makes clear that the fundamental issues of clean up that: (1) neither the EPA, nor NRC , nor FEMA is responsible for clean-up; (2) that the cleanup standards that will determine what clean-up is required (and hence its cost) have not been defined; and (c) that no funding source has been identified. These three core points were identified in an Inside EPA investigative report in 2010- *Agencies Struggle to Craft Offsite Cleanup Plan for Nuclear Power Accidents*, by Douglas Guarino, Associate Editor. The report is available on line [28] or PW can make the report available, including emails obtained by Inside EPA by FOIA. The report says that:

> EPA, the Nuclear Regulatory Commission (NRC) and the Federal Emergency Management Agency (FEMA) are struggling to determine which agency -- and with what money and legal authority -- would oversee cleanup in the event of a large-scale accident at a nuclear power plant that disperses radiation off the reactor site and into the surrounding area.

The FOIA documents indicate that the agencies began discussions in 2009 after NRC informed the other agencies that it does not plan to take the lead in overseeing such a cleanup; and significantly that money in the Price Anderson Act, an industry-funded insurance account for nuclear accidents, would likely not be available. See the documents obtained by *Inside EPA* (Part 1 and Part 2) under the Freedom of Information Act (FOIA, Part 1, July 27, 2010 Draft White Paper, developed by Jeff Blizzard (USEPA).

Until this is resolved – who is in charge, who pays, and what are the cleanup standards- the Final PAG should not be issued.

Who's In Charge – Who Is Responsible?

The Draft PAG Manual makes clear that no federal agency is in charge (section 4.1.6) - "federal departments and agencies may coordinate"(pg., 55); "Under the NRF and NDRF, FEMA may issue mission assignments to the involved federal agencies, as appropriate" (pg., 56) "NIMS was developed specifically for emergency management and may not be the most

[28] http://environmentalnewsstand.com/Environmental-NewsStand-General/Public-Content/agencies-struggle-to-craft-offsite-cleanup-plan-for-nuclear-power-accidents/menu-id-608.html

efficient response structure for long -term cleanup (pg., 57); "Issues that cannot be solved at the IC/UC or Unified Area Command level may be raised with the Joint Field Office (pg., 57); etc. "May" does not coordinate and take responsibility for getting the job done. Consequently without clear delegated authority, the job will drag on and not get done. The longer cleanup takes, probability is increased that resuspension will carry contaminants further afield and at the same time drive contaminants deep in the soil and groundwater.

History-Avoiding Federal Agency Responsibility

Disagreements over what government agency is in charge were documented in an investigative report by Inside EPA in 2010. It showed that:

EPA's Role: According to the Inside EPA investigative report, a July 27, 2010 white paper was never completed amid disagreements between EPA staff over what authority the agency may or may not have to clean up after a nuclear power plant accident. The paper cited Superfund as a possible source of cleanup funding – either through EPA's appropriation-driven Superfund trust fund or the agency's authority to sue parties responsible for contamination under Superfund law. But significantly EPA staff disagree on whether Superfund is applicable to clean up after a nuclear power plant accident, calling into question its viability as both a source of funding and cleanup authority.

Some at EPA contend that "special nuclear material from a nuclear incident" is exempt from the types of toxic releases governed by Superfund, according to the documents. Others suggest that such material is typically commingled with chemicals and other radioactive materials that are covered by the law, meaning EPA would be able to assert its Superfund authority to conduct a cleanup.

In internal e-mails, other EPA staff provides examples of instances where the agency has been involved with cleanups at nuclear power plant sites due to the sites being contaminated with chemicals. But Jean Schumann, a lawyer in EPA's Office of Emergency Management (OEM), criticized suggestions that the presence of chemical contaminants gives the agency the authority to clean up after a nuclear power plant incident. In one August 5 email, Schumann argues it is uncertain whether Superfund law gives EPA such authority when radioactive substances from the accident are commingled with other contaminants. “I think there is enough uncertainty still on what the 'release' exclusion means.”

NRC’s role: Some federal officials previously assumed NRC had authority and would be the lead agency. However, according to the FOIA documents attached, NRC said that it was not the lead agency and tried to “pass the ball” to EPA, suggesting EPA

would be the appropriate agency to lead such an effort. But, as said above, in an August 5, 2010 email, EPA’s Ms. Schumann said that it was uncertain whether Superfund Law gives EPA such authority when radioactive substances from the accident are commingled with other contaminants. In the draft white paper

FEMA’s Role: While NRC and FEMA require nuclear plants to have emergency response plans, it is not clear these plans extend beyond the initial aftermath of an accident or apply to radiation dispersed over large areas, the documents say. The government's emergency response authorities under the Stafford Act, for instance, expire 60 days after an incident, the draft document notes.

U.S. President: A Presidential declaration of an emergency “leads to rather limited financial assistance being made available through FEMA” and a “potentially more useful Presidential declaration of a major disaster” appears limited to “natural events,” the document said.

States Responsibility: It is apparent that because, “waste resulting from a large scale incident would likely overwhelm current disposal capacity” (pg., 60), “[f]ollowing a nuclear accident, the states bear primary responsibility to identify and provide waste management options, including disposal capacity.” (pg., 69)

Stakeholder Involvement: The section talks about opportunities for stakeholder involvement (pgs., 51, 52, 54-56) but it is our understanding that EPA is the only Federal Agency that requires stakeholder involvement. Therefore if EPA has a “say” in this regard, cleanup will take longer; if, on the other hand, EPA remains not the responsible lead party, then meaningful involvement is not guaranteed.

Who Pays Or Where Is The Money Coming From?

Price Anderson: the industry-funded account established under the Price Anderson Act, which Congress passed in 1957 in an effort to limit the industry's liability, would likely not be available to pay for such a cleanup. The account likely could only be used to provide compensation for damages incurred as the result of an accident, such as hotel stays, lost wages and property replacement costs, the documents show, leaving federal officials unsure where the money to pay for a cleanup would come from.

Evidence – Emails Obtained by Inside EPA's FOIA Request

The following excerpt from Stuart Walker' email, EPA, says that "The insurance funds are not used to cover cleanup costs associated with the incident."

Evidence – Emails Obtained by Inside EPA's FOIA Request

The following excerpt from Stuart Walker' email, EPA, says that "The insurance funds are not used to cover cleanup costs associated with the incident."

From:	Stuart Walker/DC/USEPA/US
To:	Charles Openchowski/DC/USEPA/US@EPA
Date:	07/30/2010 06:54 PM
Subject:	Upcoming political level (AA, Administrator, maybe Obama/Biden) exercises emergency and late phase cleanup exercises on Nuclear Power Plant Incident

> Dr. Steve Landry, SOE Support Team, reviewed the draft scenario. Dr. Landry explained that the intent of the scenario is to have significant damage that exceeds the cap of the $10 billion Price-Anderson Act (PAA). Additionally, the location chosen for the scenario event should be neither "worst case" nor "best case," but somewhere in the middle.
>
> An NRC representative stated that the PAA actually has a $12 billion cap, but that it is not really the issue. The PAA is an insurance policy for displaced persons/damage in the event of a nuclear power plant incident. Once the $12 billion has been exceeded, the U.S. Treasury will cover costs for displaced people. However, the Insurance funds are not used to cover cleanup costs associated with the incident. The NRC representative also noted that each licensee is insured for over $300 million. Whether or not D/As could recover the costs allocated towards the cleanup is an open question and would be decided by the courts, but PAA is designed to support the people affected by the accident.

The following except from the July 27, 2010 Draft White paper says that, " NRC also indicated the Price Anderson Act would be unable to pay for environmental cleanup after the nuclear power plant inci dent only for compensation for damages incurred (e.g., hotel stays, replacement costs for property and personal items, lost wages etc.

NRC-FEMA-EPA White Paper:
Potential Authorities and/or Funding Sources for Off-site Cleanup Following a Nuclear Power Plant Incident

Background:

- The Environmental Protection Agency (EPA), the Nuclear Regulatory Commission (NRC), and the Federal Emergency Management Agency (FEMA) began a series of quarterly meetings in 2009 to discuss unresolved concerns regarding off-site environmental cleanup following a nuclear power plant incident.

- NRC recently indicated to FEMA that they would not be taking the lead for off-site environmental cleanup after a nuclear power plant incident. NRC suggested EPA would be the appropriate agency to lead such efforts.

- NRC also indicated the Price Anderson Act would be unable to pay for environmental cleanup after a nuclear power plant incident, only for compensation for damages incurred (e.g., hotel stays, replacement costs for property and personnel items, lost wages, etc).

- FEMA convened a workgroup to discuss the following issues related to nuclear power plant incidents: potential Agency roles (e.g., who would lead cleanup efforts); cleanup authorities; and fund sources.

- Evaluation of language from the *Price-Anderson Act*, the *Stafford Act*, and EPA's previous policies and expectation that the *CERCLA* (Comprehensive Environmental Response, Compensation, and Liability Act) would generally not be used for response actions to address releases from NRC-licensed sites including nuclear power plants, may indicate a potential gap in authority to perform or oversee and fund off-site cleanup following a nuclear power plant incident, depending on the circumstances of the incident and the subsequent declarations of the federal government.

- The Report to Congress from the Presidential Commission on Catastrophic Nuclear Accidents (See Attachment D)[1]: outlines a number of concerns regarding nuclear power plant incidents. The report covers the sourcing of funds under a "Major Disaster," a "Catastrophe," and how to prepare and respond to a "catastrophic disaster."
    - Current plans do not cover "long-duration accidents that have impacts over large land areas".
    - The authority of the Court to award damages does not extend to executive branch powers.

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Deleted: *CERCLA* (Comprehensive Environmental Response, Compensation, and Liability Act), and

Objective:

- Provide current understanding on potential authorities and sources of funding for off-site cleanup following a nuclear power plant incident.

The next except from the July 27, 2010 Draft White paper lays out the potential cleanup authority and funding source of the Price Anderson Act. It essentially repeats what Stuart Walker, EPA, email's said in the first example, "ANI does not cover environmental cleanup costs under their primary insurance policy. It is anticipated that the secondary insurance policy will behave in a similar manner."

Potential Cleanup Authority and/or Funding Source # 1: *Price-Anderson Act*

- Examples of Potential Circumstances Where It May Be Appropriate to Use the *Price-Anderson Act*: In addition to an accident, the nuclear power plant incident may be the result of: theft or sabotage; the transportation of nuclear fuel to a reactor site; or the storage of nuclear fuel at a reactor site.

- Possible Actions under the *Price-Anderson Act*:
  - Provide financial assistance to utilities operating nuclear power plants that have experienced an incident.
  - For individuals who have suffered damages:
    - Those who suffered bodily harm, sickness, or disease will receive financial assistance.
    - Evacuees receive property damage and loss expenses as well as living expenses.
  - Local and State governments can receive financial assistance to assist with evacuations, sheltering, and other immediate response activities.

- Funding Source for the *Price-Anderson Act*:[2]
  - Under the *Price-Anderson Act*, American Nuclear Insurers (ANI) provides nuclear power plants with financial assurance by creating insurance funding pools under both a primary and a secondary insurance policy.
  - **Primary Insurance Policy:** Each year, a premium is paid by utilities that operate nuclear power plants – this premium provides offsite private insurance of $300 million.
  - **Secondary Insurance Policy:** If an incident exceeds the $300 million, each reactor would pay a prorated share of up to $95.8 million. This secondary pool contains approximately $8.6 billion.

- Potential Gap in Covering Off-site Cleanup under the *Price-Anderson Act*:
  - These funding pools can only be accessed by a federal agency if the federal agency itself has property that has suffered damages during an incident.
  - ANI does not cover environmental cleanup costs under their primary insurance policy. While not explicitly stated, there is no expectation that the secondary insurance policy will differ in coverage from the primary insurance policy.

Findings:

Potential Authorities and/or Funding Sources for Off-Site Cleanup Following a Nuclear Power Plant Incident

- *Price-Anderson Act:*
  - ANI does not cover environmental cleanup costs under their primary insurance policy. It is anticipated that the secondary insurance policy will behave in a similar manner.

Further, the following except from the July 27, 2010 Draft White paper from Kathryn Snead, EPA, explains again that there is a gap in authority to perform or oversee and fund offsite cleanup and that, at bullet 3, "NRC al so indicated the Price Anderson Act would be unable to pay for environmental cleanup after a nuclear power plant incident only for compensation for damages incurred (e.g., hotel stays, replacement costs for property and personal items, lost wages, etc.

Kathryn Snead To all, Please find attached a draft white paper o... 07/27/2010 03:51:39 PM

From: Kathryn Snead/DC/USEPA/US
To: Stuart Walker/DC/USEPA/US@EPA, Charles Openchowski/DC/USEPA/US@EPA, Jennifer Mosser/DC/USEPA/US@EPA, Susan Stahle/DC/USEPA/US@EPA, Lee Tyner/DC/USEPA/US@EPA, Jean Schumann/DC/USEPA/US@EPA
Cc: Lee Veal/DC/USEPA/US@EPA, Jeffrey Blizzard/DC/USEPA/US@EPA
Date: 07/27/2010 03:51 PM
Subject: White Paper on Off-Site Cleanup Following a Nuclear Power Plant Incident

NRC-FEMA-EPA White Paper:
Potential Authorities and/or Funding Sources for Off-site Cleanup Following a Nuclear Power Plant Incident

Background:

- The Environmental Protection Agency (EPA), the Nuclear Regulatory Commission (NRC), and the Federal Emergency Management Agency (FEMA) began a series of quarterly meetings in 2009 to discuss unresolved concerns regarding off-site environmental cleanup following a nuclear power plant incident.
- NRC recently indicated to FEMA that they would not be taking the lead for off-site environmental cleanup after a nuclear power plant incident. NRC suggested EPA would be the appropriate agency to lead such efforts.
- NRC also indicated the Price Anderson Act would be unable to pay for environmental cleanup after a nuclear power plant incident, only for compensation for damages incurred (e.g., hotel stays, replacement costs for property and personnel items, lost wages, etc).
- FEMA convened a workgroup to discuss the following issues related to nuclear power plant incidents: potential Agency roles (e.g., who would lead cleanup efforts); cleanup authorities; and fund sources.
- Evaluation of language from the *Price-Anderson Act*, the *Stafford Act*, and EPA's previous policies and expectation that the *CERCLA* (Comprehensive Environmental Response, Compensation, and Liability Act) would generally not be used for response actions to address releases from NRC-licensed sites including nuclear power plants, may indicate a potential gap in authority to perform or oversee and fund off-site cleanup following a nuclear power plant incident, depending on the circumstances of the incident and the subsequent declarations of the federal government.
- The Report to Congress from the Presidential Commission on Catastrophic Nuclear Accidents (See Attachment D)[1]: outlines a number of concerns regarding nuclear power plant incidents. The report covers the sourcing of funds under a "Major Disaster," a "Catastrophe," and how to prepare and respond to a "catastrophic disaster."
    - Current plans do not cover "long-duration accidents that have impacts over large land areas".
    - The authority of the Court to award damages does not extend to executive branch powers.
- The following are questions and concerns are unresolved:

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Deleted: *CERCLA* (Comprehensive Environmental Response, Compensation, and Liability Act), and

DRAFT: DO NOT CITE OR QUOTE *July 27, 2010*

Potential Cleanup Authority and/or Funding Source # 1: *Price-Anderson Act*

- Examples of Potential Circumstances Where It May Be Appropriate to Use the *Price-Anderson Act*: In addition to an accident, the nuclear power plant incident may be the result of: theft or sabotage; the transportation of nuclear fuel to a reactor site; or the storage of nuclear fuel at a reactor site.

- Possible Actions under the *Price-Anderson Act*:
    - o Provide financial assistance to utilities operating nuclear power plants that have experienced an incident.
    - o For individuals who have suffered damages:
        - ▪ Those who suffered bodily harm, sickness, or disease will receive financial assistance.
        - ▪ Evacuees receive property damage and loss expenses as well as living expenses.
    - o Local and State governments can receive financial assistance to assist with evacuations, sheltering, and other immediate response activities.

- Funding Source for the *Price-Anderson Act*:[2]
    - o Under the *Price-Anderson Act*, American Nuclear Insurers (ANI) provides nuclear power plants with financial assurance by creating insurance funding pools under both a primary and a secondary insurance policy.
    - o **Primary Insurance Policy:** Each year, a premium is paid by utilities that operate nuclear power plants – this premium provides offsite private insurance of $300 million.
    - o **Secondary Insurance Policy:** If an incident exceeds the $300 million, each reactor would pay a prorated share of up to $95.8 million. This secondary pool contains approximately $8.6 billion.

- Potential Gap in Covering Off-site Cleanup under the *Price-Anderson Act*:
    - o These funding pools can only be accessed by a federal agency if the federal agency itself has property that has suffered damages during an incident.
    - o ANI does not cover environmental cleanup costs under their primary insurance policy. While not explicitly stated, there is no expectation that the secondary insurance policy will differ in coverage from the primary insurance policy.

The following drafts from NRC-FEMA-EPA White paper: Potential Authorities and/or Funding Sources for Off-site Cleanup Following a Nuclear Power Plant Accident, July 27, 2010, Pg., 3 repeat the same language.

- Funding Source for the *Price-Anderson Act*:[2]
  - Under the *Price-Anderson Act*, American Nuclear Insurers (ANI) provides nuclear power plants with financial assurance by creating insurance funding pools under both a primary and a secondary insurance policy.
  - **Primary Insurance Policy:** Each year, a premium is paid by utilities that operate nuclear power plants – this premium provides offsite private insurance of $300 million.
  - **Secondary Insurance Policy**: If an incident exceeds the $300 million, each reactor would pay a prorated share of up to $95.8 million. This secondary pool contains approximately $8.6 billion.
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At 6,

Findings:

Potential Authorities and/or Funding Sources for Off-Site Cleanup Following a Nuclear Power Plant Incident

- *Price-Anderson Act:*
  - ANI does not cover environmental cleanup costs under their primary insurance policy. It is anticipated that the secondary insurance policy will behave in a similar manner.

At 17

----- Forwarded by Elizabeth Southerland/DC/USEPA/US on 06/11/2010 12:13 PM -----

From: Stuart Walker/DC/USEPA/US
To: Elizabeth Southerland/DC/USEPA/US@EPA, Davidw Charters/ERT/R2/USEPA/US@EPA, Helen Dawson/DC/USEPA/US@EPA
Cc: Charles Openchowski/DC/USEPA/US@EPA
Date: 06/11/2010 11:57 AM
Subject: Senior management meeting needed to discuss ongoing staff meetings with NRC and FEMA to resolve responsibilities for early, intermediate, and long-term response to nuclear power plant incidents

Hi Betsy,

See attached email from Colby Stanton that began EPA's involvement with NRC/FEMA efforts to clarify how response to a significant release (e.g., Three Mile Island, Chernobyl) from a commercial nuclear power plant (NPP) would be handled.

After 3 meetings with the other Agencies at the programmatic and general counsel staff, both Charles Openchowski and I believe that we need to have a senior level management meeting to discuss EPA's strategy for these efforts.

There are numerous issues that have arisen during these meetings since Colby's initial note, including:

1. Monies collected from nuclear industry to pay out in the event of a "nuclear incident" go to an insurance company for disbursement. It appears the monies may only go for compensating damages (e.g., cost of temporary or permanent relocation, pay for policemen, personal property replacement, etc) and not environmental cleanup.

2. There appears to not be pre-identified source of funding for environmental cleanup. NRC staff anticipates this would be handled by some type of supplemental appropriation.

3. There is a FEMA expectation that EPA would be heavily involved in the environmental response work, possibly as the lead technical agency (think OSC, RPM role). EPA has not previously been major players in NRC exercises for NPP releases.

Charles and I believe we need a senior level management meeting (OSRTI, OEM, ORIA, OGC, and OHS) to discuss:

1. What would be proper role for EPA in these types of events, including the role of each of our primary offices and respective regional counterparts.
   -- There are of resource (FTEs and $'s) implications for EPA's level of involvement both during a real event and during exercises.
   -- There are also policy implications if EPA appears to be endorsing other cleanup approaches even in a remedial contractor role for NPP events, similar to concerns raised regarding the PAGs.

2. Given the current circumstances dealing with the Gulf spill (e.g., questions about who is in charge, is the federal government in control, etc) not inhibiting our flexibility under CERCLA is a key issue. Although possibly not the first choice to take a response action during a NPP incident, EPA should not agree to language that appears to a legal interpretation that inhibits this option.

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To: Elizabeth Southerland/DC/USEPA/US@EPA, Davidw Charters/ERT/R2/USEPA/US@EPA, Helen Dawson/DC/USEPA/US@EPA
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At 36,

From: Kathryn Snead/DC/USEPA/US
To: "Benowitz, Howard" <Howard.Benowitz@nrc.gov>, "Blunt, Kenyetta" <kenyetta.blunt@dhs.gov>, Sara DeCair/DC/USEPA/US@EPA, "DeFelice, Anthony" <anthony.defelice@dhs.gov>, diane.donley@dhs.gov, "Greten, Timothy" <Timothy.Greten@dhs.gov>, grace.kim@nrc.gov, "Milligan, Patricia" <Patricia.Milligan@nrc.gov>, Jennifer Mosser/DC/USEPA/US@EPA, Charles Openchowski/DC/USEPA/US@EPA, Jean Schumann/DC/USEPA/US@EPA, anneliese.simmons@nrc.gov, Susan Stahle/DC/USEPA/US@EPA, Lee Tyner/DC/USEPA/US@EPA, Stuart Walker/DC/USEPA/US@EPA, Jeffrey Blizzard/DC/USEPA/US@EPA
Cc: Lee Veal/DC/USEPA/US@EPA
Date: 05/25/2010 09:57 AM
Subject: EPA-NRC-FEMA Recovery Discussion on Nuclear Power Plant Incidents

To all,

I apologize about the short notice - my fault for taking so long to send this out:

Our next inter-agency discussion on Recovery from Nuclear Power Plant Incidents:
June 3, 2010 from 1 PM - 3 PM
Follows the FRPCC Meeting (with a break for lunch 11:30 AM - 1 PM)
Crystal City Courtyard Marriott
Blue Ridge Shenandoah Conference Room
2899 Jefferson Davis Highway
Arlington, VA 22202

A few action items that were identified during the last meeting:
- Anneliese Simmons, NRC, agreed to provide example text on the insurance exclusion language on cleanup.
- Anneliese Simmons, NRC, agreed to check on what was meant by "clearly identifiable accidents".

At 45

From: "Greten, Timothy" <Timothy.Greten@dhs.gov>
To: Stuart Walker/DC/USEPA/US@EPA, Kathryn Snead/DC/USEPA/US@EPA
Cc: Charles Openchowski/DC/USEPA/US@EPA, Colby Stanton/DC/USEPA/US@EPA, <grace.kim@nrc.gov>, "Benowitz, Howard" <Howard.Benowitz@nrc.gov>, Jean Schumann/DC/USEPA/US@EPA, Lee Tyner/DC/USEPA/US@EPA, "Milligan, Patricia" <Patricia.Milligan@nrc.gov>, Sara DeCair/DC/USEPA/US@EPA, Susan Stahle/DC/USEPA/US@EPA, "Greten, Timothy" <Timothy.Greten@dhs.gov>
Date: 11/30/2009 07:16 PM
Subject: RE: Agenda: EPA-NRC-FEMA Recovery Discussion

Potential Issue - FEMA looking for someone (e.g., EPA, Corps) to run cleanup of public property after nuclear power plant accident

Stuart Walker to: Elizabeth Southerland, Helen Dawson 12/08/2009 02:17 PM
Cc: RobinM Anderson

Betsy, this is a follow-up email about what I mentioned to you in the hall. Last week I, OEM, ORIA, and OGC staff (including Charles) met with FEMA and NRC policy and general counsel staff.

We were meeting to discuss the role of NRC, EPA, and FEMA after a catastrophic release from a nuclear power plant, and how the compensation clauses of the Price Anderson Act might come into play because of the CERCLA definition of "release" (which makes a reference to Price-Anderson in excluding some releases from CERCLA jurisdiction). In Price-Anderson, Congress in essence set up a federally-backed insurance scheme to compensate victims of a nuclear reactor accident (e.g., Three Mile Island).

I had thought that EPA was there to explain why previous policy from the removal program was incorrect in stating EPA could not respond to such releases under CERCLA authority, but rather EPA had authority but generally expected NRC to have authority over such incidents and did not expect to be involved except for possible help requested by NRC and/or state.

I was surprised to find out that NRC did not intend to be involved in the cleanup or Price-Anderson compensation decisions for contamination that was outside the fenceline of the facility. NRC said that the authority for spending the $10 billion insurance dollars that could become available when the Price Anderson Act is triggered would be lie with an Insurance Company. After those funds were gone, they thought EPA might handle the site cleanup.

NRC does not currently know if the $10 billion can only be used for compensation for damages suffered by members of the public, or if it can be used for site cleanup. Also they have not asked the insurance company if they have any plans/guidance on how they will decide to distribute the monies, whether they have contractors lined up to do the cleanup work or would they expect each affected property owner to do the cleanup after getting a claim paid, or how they will answer the question of "how clean is clean" for purposes of either cleanup or determining what is considered contaminated for the purposes of compensation.

We will be meeting together again as a group. NRC intends on finding out answers to the groups question either prior to that meeting or possibly inviting the insurance company to the next meeting.

fyi, attached is the agenda for the meeting. Below is an email from FEMA the night before the meeting that lays out some of the issues.

> The one thing I'm reasonably sure about is the cost for a major long-term cleanup would be in excess of $10bil. If either Stafford Act or Superfund are tapped for $$, the bill is going to be so high that Congress will have to appropriate funds--there is no other way this bill will be paid. And getting those funds will be a political decision negotiated the heads of EPA, FEMA/DHS, NRC, Congress, and the White House.
>
> The first deliverable this group should put together is a memo/paper that reads as a guide through this decision making process, explaining the steps and the different decision points. I think it should shy away from trying to toss the funding burden over the fence and say "supertund must do this!" or "Stafford act must do this", and stick to a neutral explanation of what the consequences of each funding action would be (i.e. "[blank] could be funded by CERCLA--the language allows it. However, CERCLA is incredibly underfunded for something like this). A political tool-kit, if you will, that lays out options and tradeoffs.
>
> The second deliverable would be a memo simply explaining the how of administering a long-range cleanup...that is, no matter who pays for it, it will be a join effort. Each of the agencies has a key ability they bring to the table--EPA understands environmental cleanup/remediation, NRC understands the nuclear power industry, and FEMA has longstanding relationships with state/local government, law enforcement, etc. Both in distributing funding and administering a cleanup, all of these skills would be needed (one agency doesn't have the manpower, either in skill sets or sheer numbers, to pull it off). Also, all of the agencies would essentially be robbing peter to pay paul during a cleanup--they simply don't have standby resources for this beyond a thin bench.
>
> See all of you tomorrow morning!
>
> Tim

The above (12/08/09) paragraph 5 -6 says that, "NRC does not currently know if the $10 billion can only be used for compensation for damages suffered by member of the public, or if it can be used for site cleanup. Also they have not asked the insurance company…how they will answer the question of 'How clean is clean' for purposes of either cleanup or determining what is considered contaminated for the purposes of compensation." By the time they wrote the July 27, 2010 Draft, they were clear that ANI only would pay for damages not cleanup, as the preceding emails show.

At 45,

From: "Greten, Timothy" <Timothy.Greten@dhs.gov>
To: Stuart Walker/DC/USEPA/US@EPA, Kathryn Snead/DC/USEPA/US@EPA
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Date: 11/30/2009 07:16 PM
Subject: RE: Agenda: EPA-NRC-FEMA Recovery Discussion

Good evening!

I hope everyone had a good Thanksgiving and made it through Monday.

After reading through the agenda and other notes, I ask that we move the discussion of the Stafford Act to after both Price Anderson and CERCLA have been discussed. Both of the other funding mechanisms should be discussed before we get to the Stafford Act, as both are the appropriate funding avenues before a Stafford Act declaration is made.

That said, I also have a suggestion about what our outcome might be, based on my discussing w/Diane Donnelly today. Please also excuse me if I'm missing key nuances or information here--I might be the newest player in this game.

I'm not sure how much cleaning up after a respectably-size nuclear power plant incident would cost. $50bil? The mechanisms set up by Price Anderson have set up a $10bil pool to pay for certain expenses. After that is exhausted, and for those expenses not covered, what vehicles are available? This is covered under Superfund language...yet my understanding is Superfund is essentially broke, as industry hasn't paid in since the mid 1990s. Likewise, Stafford Act funds are not available until a declaration is issued--and then only in line with what the declaration covers.

The one thing I'm reasonably sure about is the cost for a major long-term cleanup would be in excess of $10bil. If either Stafford Act or Superfund are tapped for $$, the bill is going to be so high that Congress will have to appropriate funds--there is no other way this bill will be paid. And getting those funds will be a political decision negotiated the heads of EPA, FEMA/DHS, NRC, Congress, and the White House.

The first deliverable this group should put together is a memo/paper that reads as a guide through this decision making process, explaining the steps and the different decision points. I think it should shy away from trying to toss the funding burden over the fence and say "superfund must do this!" or "Stafford act must do this", and stick to a neutral explanation of what the consequences of each funding action would be (i.e. "[blank] could be funded by CERCLA--the language allows it. However, CERCLA is incredibly underfunded for something like this). A political tool-kit, if you will, that lays out options and tradeoffs.

The second deliverable would be a memo simply explaining the how of administering a long-range cleanup...that is, no matter who pays for it, it will be a join effort. Each of the agencies has a key ability they bring to the table--EPA understands environmental cleanup/remediation, NRC understands the nuclear power industry, and FEMA has longstanding relationships with state/local government, law enforcement, etc. Both in distributing funding and administering a cleanup, all of these skills would be needed (one agency doesn't have the manpower, either in skill sets or sheer numbers, to pull it off). Also, all of the agencies would essentially be robbing peter to pay paul during a cleanup--they simply don't have standby resources for this beyond a thin bench.

See all of you tomorrow morning!

Tim

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See all of you tomorrow morning!

Tim

January 7, 2011

Re: Fw: Price Anderson info
Stuart Walker to: Jeff Maurer 08/11/2010 05:44 PM
Cc: Gilberto Irizarry, Kathy Jones, Lois Gartner, Randy Deitz

We haven't ever spelled this out anywhere. Nor has final cleanup levels been discussed by the FEMA, NRC, EPA workgroup looking at Price Anderson Act issues. So I don't have a clear answer, but here are some of my thoughts.

EPA has said that under CERCLA, and some other environmental laws (e.g., SDWA, CAA, AEA) that 25/100 mrem is not protective. So I don't think we would want to say we would promoting that as a cleanup level. Also, at one point during the DHS PAG (guidance for dirty bombs and nuclear weapons) development process NRC said they wanted a final cleanup level of 1 to 10 rem (that is 1,000 mrem to 10,000 mrem) and they wanted to apply those cleanup numbers to nuclear power plant meltdowns. I am not sure if NRC still feels the same way now.

In some of the AA level (OAR, OSWER, OW, OGC) which were followed up by Gina MCcarthy of OAR meeting with Lisa Jackson, it was decided we would NOT be using optimization in the ORIA PAG (Protective Action Guidelines) that would be proposed for final cleanup. We would instead be talking about using existing standards. Since this language still has too be drafted it is not certain if/how specifically CERCLA will be mentioned.

Thank you for the opportunity to make comment. We sincerely hope our comment is instructive and that the final PAG will be changed to reflect our comments.

Respectfully,

Mary Lampert
Pilgrim Watch, director
148 Washington Street
Duxbury, MA 02332
Tel 781.934.0389
Email: mary.lampert@comcast.net

NRDC
THE EARTH'S BEST DEFENSE

July 15, 2013

Via Electronic Mail

U.S. Environmental Protection Agency
1200 Pennsylvania Ave NW
Washington, DC 20004

RE: Natural Resources Defense Council Comments on the EPA's DRAFT PAG Manual

Dear Sir/Madam:

The Natural Resources Defense Council (NRDC) offers the following comments regarding the Environmental Protection Agency's (EPA's) Draft "PAG Manual: Protection Action Guides and Planning Guidance for Radiological Releases," March 2013, Docket ID No. EPA-HQ-OAR-2007-0268. This manual is a proposed draft of an update of EPA's 1991 PAG Manual, 78 Fed. Reg. (15 April 2013) 22257-22260.

General Comments

The National Academies' BIER VII, Phase 2 Report gives "preferred estimates" of cancer risk per unit dose along with 95% subjective confidence intervals. The upper and lower bounds of these confidence intervals are typically a factor of two above and below the preferred estimates. In the event of a radiological accident, the bounds on the government's best estimates of effective doses to individuals—at 95% confidence—are likely to be significantly larger than a factor of two above and below the best estimates. Moreover, health risks can vary by as much as a factor of 20 depending upon the age and gender of the exposed individuals (and fetuses) and whether the government seeks to protect exposed individuals against the occurrence of cancer (morbidity) or only cancer fatality. Consequently, NRDC believes EPA can better serve the public by providing a more comprehensive discussion of risk, rather than focusing primarily on the specific dose ranges that should trigger protective actions. Further, where PAGs are offered EPA should establish separate PAGs for pregnant women, young children, average adults and senior citizens, or, in the alternative, set a single standard for all individuals at a level that protects the most vulnerable. In all cases the PAGs should be set on the basis of preventing cancer (cancer morbidity) and not just preventing fatalities.

NRDC endorses the analysis and recommendations of the group letter submitted by the Committee to Bridge the Gap, the Nuclear Information and Resource Service, NRDC and others, the conclusions of which are summarized here:

- Withdraw the 2013 EPA PAGs (Protective Action Guides)
- Do not weaken drinking water standards for radioactivity. Comply with existing Safe Drinking Water Act limits especially in the intermediate and late phases of disasters and cleanup. Provide real, concrete guidance to authorities on how to safeguard water supplies to protect the public to those levels or better.
- Eliminate any implication that EPA PAGs incorporate the worst provisions of Dept. of Homeland Security PAGS including "optimization" (a cost benefit analysis done by the polluter), use of "benchmarks" or ranges of radiation risk much higher than EPA historically allows.
- EPA should retain and strengthen, relocation PAGs for thyroid and skin doses and keep and strengthen (not weaken) the limit of 5 rem over 50 years.
- Replace the outdated FDA food contamination guidelines with markedly lower radioactivity in food.
- Do not permit nuclear waste to be disposed in regular garbage dumps, incinerators or hazardous waste sites, or sent to recyclers. Treat it like nuclear waste.
- Do not expand the PAGs, originally for big nuclear disasters, to apply to every radioactive release.
- We recommend that all parts of the PAGs that weaken or eliminate existing protections be abandoned, and all dose limits be tightened by at least the increased risk EPA now acknowledges for radiation.

Chapter 2, Early Phase Protection Action Guides.

EPA did not update its Early Phase Protection Action Guides for sheltering-in-place or evacuation [1 to 5 rem (10 mSv to 50mSv) over 4 days], from those in EPA's 1991 PAG Manual, and did not update the cost-benefit analysis which was the basis for the 1991 recommendations. NRDC believes these Early Phase PAGs are too low by roughly an order of magnitude—roughly a factor of 10. Our reasoning follows.

First, the 1991 PAG Manual, Appendix C assessment is based on an assumed risk of $3x10^{-4}$ cancer deaths per person-rem. Since 1991, the National Academies BEIR Committee has revised its risk estimates. The BEIR VII, Phase 2 Report (2006) best estimates is $5.7x10^{-4}$ cancer fatalities per person-rem for a mixed population of all ages and both genders. The government's price deflator index has increased by about 50 percent since 1991. Therefore, updating these two quantities alone suggest the Early Phase PAGs should be reduced by a factor of 2.5

from the 1991 recommendations.

Second, while the BEIR VII, Phase 2 Report (2006) preferred estimate is 5.7×10^{-4} cancer fatalities per person-rem for a mixed population of all ages and both genders, the preferred estimate for morbidity is 26.2×10^{-4} cancers per person-rem for a population of 10 year old girls. Thus, the morbidity risk for 10 year old girls is approximately 4.6 times greater than the fatality risk for a population of all ages and both sexes, and for young female babies or fetuses the risk is estimated to be more than twice as great as that for 10 year old girls.

As noted above, EPA's Early Phase Protection Action Guides for sheltering-in-place or evacuation are 1 to 5 rem (10 mSv to 50mSv) over 4 days. Based upon the preferred estimate from BEIR VII, a 10 year old girl exposed to 0.5 rem [5 mSv] would have a 0.13 percent chance of an excess cancer—one excess cancer in a population of 765 exposed girls. BEIR VII's 95 percent confidence limits approximate a factor of two higher and lower than its preferred estimate. Surely, in a community containing 765 young girls, one would seek to shelter or evacuate these girls to avoid the expected cancer(s) (uncertainty range 0.5 to 2 cancers).

In the introduction to Chapter 2, EPA properly notes, "In all cases. All practical and reasonable means should be used to reduce or eliminate exposure." Nevertheless, this cautionary note will be lost on a reader focusing on the numerical PAGs given in Table 2-1. Both in the introduction and the tables EPA should remind government officials and the public that a basic tenet of the health physics profession is that all radiation exposures are potentially harmful and therefore any radiation exposure should be kept as low as reasonably achievable. In this regard, unlike evacuation, there is minimal risk associated with sheltering-in-place. Thus, in the event of a significant radiation release or the potential for an imminent release, sheltering-in-place may be advisable even when the projected doses are less than the PAGs.

Protective Action Guidance for Drinking Water

EPA did not propose a specific drinking water PAG. Rather, the agency seeks input on an approach and technical rationale for a drinking water PAG. (PAG Manual, p. 42) Given that bottled water is widely available commercially throughout the country, NRDC sees no necessity in relaxing the established enforceable drinking water standards for radionuclides under the Safe Drinking Water Act (SDWA), limiting exposures from drinking water to 4 mrem per year.

Protective Action Guidance for Food

EPA endorses the PAGs contained in the FDA's "Accidental Radioactive Contamination of Human Foods and Animal Feeds: Recommendations for State and Local Agencies" (FDA 1998), PAG Manual, p. 42. As noted in the April 15, 2013, press release of the Committee to Bridge the Gap and the Nuclear Information and Resource Service (*see* Attachment A), "Extremely high food contamination levels would be allowed by the incorporation of Food and Drug Administration 1998 guidance. EPA officials had previously criticized those standards, saying that 1 in 50 people eating food at those levels would get cancer from their exposure, on top of our normal cancer risk." EPA apparently has forgotten that it is responsible for establishing Federal Guidance for radiation protection, and that it should not accede to the recommendations of other agencies that are contrary to the EPA's record on the matter.

Conclusion

For the above reasons NRDC believes EPA should withdraw the Draft 2013 EPA Protective Action Guides and start afresh, remembering that its responsibility is to protect the public.

Thank you for your consideration of these comments. Please do not hesitate to contact us at (202) 289-6868 if you have any questions.

Sincerely,

_________/s/__________
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Attachment A

EPA Dramatically Weakens Radiation Protection

For Immediate Release
Contacts: Dan Hirsch Committee to Bridge the Gap 831 336 8003
Diane D'Arrigo Nuclear Information and Resource Service 301 270 6477 x 15

April 15, 2013 The U.S. Environmental Protection Agency (EPA) is publishing in the Federal Register today controversial new Protective Action Guides (PAGs) for responding to radioactive releases. EPA says it solicits public comment but is nonetheless making the PAGs immediately effective.

The new PAGs eliminate requirements to evacuate people in the face of high projected thyroid, skin, or lifetime whole body doses; recommend dumping radioactive waste in municipal garbage dumps not designed for such waste; propose five options for drinking water, which would dramatically increase the permitted concentrations of radioactivity in drinking water, by as much as 27,000 times, compared to EPA's current Safe Drinking Water Act limits; and suggest markedly relaxing long-term cleanup standards.

"In essence the government is now saying nuclear power accidents could produce such widespread contamination and produce such high radiation levels that the government should abandon efforts to clean it up and instead force people to live with radiation-induced cancer risks orders of magnitude higher than ever considered acceptable," said Daniel Hirsch, president of Committee to Bridge the Gap.

The PAGs are intended to guide the response to nuclear power reactor accidents (like Fukushima in Japan, Chernobyl in Ukraine and Three Mile Island in the U.S.), "dirty bomb" explosions, radioactive releases from nuclear fuel and weapons facilities, and nuclear transportation accidents.

"EPA ignores the fact that women and kids are at even greater risk from radiation. The doses permitted by the 2013 EPA PAGs will allow indecent exposures to radiation," says Diane D'Arrigo of Nuclear Information and Resource Service. "Women are 50% more vulnerable than men and children are at even greater risk from radiation than adults, according to data from the National Academy of Sciences."

Extremely high food contamination levels would be allowed by the incorporation of Food and Drug Administration 1998 guidance. EPA officials had previously criticized those standards, saying that 1 in 50 people eating food at those levels would get cancer from their exposure, on top of our normal cancer risk.

The PAGs also incorporate and expand controversial Dept. of Homeland Security (DHS) PAGs adopted in 2008 which would allow long-term doses as high as thousands of millirems per year without cleanup being required. Associated guidance for carrying out the long-term cleanup, prepared for DHS and for which the comment period expires today, recommends abandoning EPA's long-held cleanup standards and instead allowing people to be exposed to doses as high as the equivalent of three chest X rays a day for one's entire life. Over 70 years, EPA estimates 1 in 6 people would get cancer from exposure that high, orders of magnitude higher risk than EPA has historically said is acceptable.

Attachment A

In addition, EPA admits that a nuclear power accident could far exceed the capacity of radioactive waste sites to manage waste generated from cleanups and therefore suggests allowing the waste to go to regular trash dumps, a fight the public has waged for decades in the US.

For more information: www.committeetobridgethegap.org and www.bit.ly/radstandards

Nuclear Energy Information Service
Illinois' Nuclear Power Watchdog since 1981
Office and Mail: 3411 W. Diversey Avenue, #16, Chicago, IL 60647-1245
(773)342-7650 www.neis.org neis@neis.org

August 1, 2013

The Honorable Gina McCarthy
Administrator and Acting Administrator
U.S. Environmental Protection Agency

Former Assistant Administrator for Air and Radiation

The Honorable Bob Perciasepe
Deputy Administrator
U.S. Environmental Protection Agency
Ariel Rios Building
1200 Pennsylvania Ave., N.W.
Washington, DC 20460

US EPA Air and Radiation Docket and Information Center
Mail Code: 6102T, 1200 Pennsylvania Ave NW, Washington, DC 20460
a-and-r-docket@epa.gov; Docket ID No. EPA-HQ-OAR-2007-0268;
www.regulations.gov; Fax (202) 566-1741

Re: Protective Action Guides for Radionuclides
(Docket ID No. EPA–HQ–OAR–2007–0268)

Dear Administrator McCarthy and Deputy Administrator Perciasepe:

Thank you for the opportunity to comment on EPA's proposed alleged Protective Action Guidelines (PAG) for Radionuclides.

We apologize for submitting these comments late; however when we attempted to forward them electronically via the EPA website, we received this notice:

> Server not found
> Firefox can't find the server at erule-outage.erulemaking.net.

We ask that you take this tech-glitch into account, and accept these comments.

In short we are adamantly opposed to the PAGs as they have been presented. Previously, we signed on to comments which will be presented with other co-signers by the Nuclear Information and Resource Service (NIRS) of Takoma Park, Maryland, and for which as a convenience we present in summary below. We wish to make comments in addition to those provided in the NIRS sign-on letter.

NIRS LETTER SUMMARY POINTS:

Our primary concerns are:
(1) the proposal to allow, for one to several years after a release, radioactive contamination of drinking water at levels orders of magnitude above EPA's longstanding Safe Drinking Water Act (SDWA) limits,

(2) language contemplating long-term cleanup standards vastly less protective than EPA's historically acceptable risk range,
(3) the elimination of relocation PAGs for high thyroid and skin doses and for high projected cumulative whole body doses,
(4) the recommendation to permit radioactive waste to be disposed of in unlicensed disposal sites, including regular municipal garbage dumps,
(5) the inappropriate expansion of the PAGs to cover essentially all radioactive releases, from the most extraordinary (e.g. nuclear weapons explosions) to those far less consequential (e.g. transportation accidents involving relatively small amounts of radioactivity),
(6) relying on PAG dose limits as high or higher than those in effect decades ago despite the fact that official estimates of cancer risks from radiation have increased significantly over that period, and
(7) apparently un-reviewed retention of archaic and extremely high FDA food contamination guidelines.

ADDITIONAL NEIS COMMENTS:

1.) Radiation standards and the BEIR VII Report: To our knowledge no official refutation of the findings of the 2005 National Academy of Sciences BEIR VII Report, ***Health Risks From Exposure to Low Levels of Ionizing Radiation: BEIR VII – Phase 2***, have been adopted as the basis for the understanding of the effects of ionizing radiation. That Report validates the linear no-threshold standard for radiation exposure. For the EPA to promulgate PAGs which in essence allow for greater radiation exposure under disaster scenarios would mean that the federal government sanctions some kind of "permissible" level of additional deaths in contradiction to established scientific principles and norms. This is neither respectable science or policy, nor morally and ethically tolerable behavior for civilized nations.

2.) The "new normal" for radiation exposures: The historical record is constantly demonstrating that the amount of human contributed and artificially reconcentrated radiation is increasing in the environment. The development, testing and use of nuclear and uranium weapons, including depleted uranium (DU); the massive introduction of medical treatments and diagnostics; the consequent increase in the stockpiles of radioactive wastes; the attempts to expand the use of nuclear power worldwide; the inevitable probabilistic increase in intentional (a.k.a, "permissible") and accidental releases of radionuclides and disasters, such as Windscale, Chelyabinsk, Santa Suzanna, the Rio Puerco River, Three Mile Island, Chornobyl, Tokaimura, and Fukushima; and more recently the introduction of additional radium and radon contamination from the nascent fracking industry – all lead to the conclusion that, not only is the radiation inventory and hence public exposure to radiation increasing, but that somehow this is supposed to be an "accepted" consequence, a "new fact of Life."

We write to inform you – **this is NOT acceptable**. Weakening radiation standards and guidelines at a time when exposures from radiation from all sources are demonstrably on the increase is unacceptable, bad public policy, and morally and ethically reprehensible It seems to have become the unfortunate norm and habit of governmental regulatory bodies to adopt the bad habit that private industry has long institutionalized – avoid taking responsibility for harm done at all cost, unless the public bears that cost.

These PAGs lead to the conclusion that the U.S. government's position for radiation disasters is simply to move the goalposts, not hold accountable the environmental criminals responsible for the disasters. We remind you that the "P" in EPA is supposed to stand for "protection." The only thing offered "protection" by these PAGs is corporate financial interests, not public or environmental health.

We will not accept as valid standards – or even guidelines -- which condone or do additional harm to the public and the environment. These PAGs do both.

3.) Behavior of EPA representatives: In the course of disseminating its positions on the PAGs, an article that appeared in the Global Security Newswire [1] reports the following presentation by an EPA official:

> Speaking at a March 12 symposium hosted by the Defense Strategies Institute, **Paul Kudarauskas**, of the EPA Consequence Management Advisory Team, said events like Fukushima would cause a "fundamental shift" to cleanup.
>
> U.S. residents are used to having "cleanup to perfection," but will have to abandon their "not in my backyard" mentality in such cases, Kudarauskas said. ***"People are going to have to put their big boy pants on and suck it up."*** *(emphasis ours)*

While it's possible we misunderstand the thrust of Mr. Kunderauskas' comments, the notion that people are just going to have to get used to increased radiation contamination caused by irresponsible industries and wimp-assed regulatory accomplices is simply not one that we're going to be "sucking up" and getting used to any time soon. Please take that advisory to the bank.

That a public official – from ANY agency, let alone one supposedly dedicated to "protection" of the public -- would make such a patronizing, condescending and insulting statement in defense of "guidelines" dedicated to increasing public harm demonstrates

- that the Agency has abandoned its primary mission; and
- that the official making such remarks does not how to deal with the public, nor act in public

As a result, we request:

1.) that the EPA abandon these Guidelines

2.) that Mr. Kunderauskas be public censured, so co-workers understand what kinds of behavior are unacceptable; and

3.) that Mr. Kunderauskas be dismissed.

Thank you for the opportunity to present our additional views.

Gratefully,

David A. Kraft, Director

[1] "White House Supports Rollback of Cleanup Standards for Nuclear Incidents," Global Security Newswire, March 25, 2013.
http://www.nti.org/gsn/article/white-house-backs-rollback-cleanup-standards-nuclear-incidents/

David Kraft <neis@neis.org>
08/02/2013 06:34 PM

To Group A-AND-R-DOCKET@EPA
cc
bcc
Subject comments

Greetings --
We wish to submit the attached comments for the following docket:

Re: Protective Action Guides for Radionuclides

(Docket ID No. EPA–HQ–OAR–2007–0268)

Dear Administrator McCarthy and Deputy Administrator Perciasepe:

Thank you for the opportunity to comment on EPA's proposed alleged Protective Action Guidelines (PAG) for Radionuclides.

We apologize for submitting these comments late; however when we attempted to forward them electronically via the EPA website, we received this notice:

> **Server not found**
>
> **Firefox can't find the server at erule-outage.erulemaking.net.**

We ask that you take this tech-glitch into account, and accept these comments.

Thank in advance.

--Dave Kraft--

--
David A. Kraft, Director
NEIS
3411 W. Diversey #16

Chicago, IL 60647
(773)342-7650
neis@neis.org
www.neis.org
SKYPE address: davekhamburg

No more Chornobyls! No more Fukushimas!
Invest in a nuclear-free world -- today!

NEIS PAG comments 8-2-13.docx

MessageID: <492ABC5CE9C3414CBD9EF5E87C862F64155BCE9A@NIRSSRV2.NIRS.local>
From: Diane D'Arrigo <dianed@nirs.org>
Sent: 08/04/2013 05:05:58 PM
Subject: RE: comments

Body: The deadline is extended until sept 16 so they are not late …

I am late on alerting folks to the extension!

dd

From: David Kraft [mailto:neis@neis.org]
Sent: Friday, August 02, 2013 6:35 PM
To: a-and-r-docket@epa.gov
Subject: comments

Greetings --

We wish to submit the attached comments for the following docket:

Re: Protective Action Guides for Radionuclides

(Docket ID No. EPA–HQ–OAR–2007–0268)

Dear Administrator McCarthy and Deputy Administrator Perciasepe:

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We ask that you take this tech-glitch into account, and accept these comments.

Thank in advance.

--Dave Kraft--

--

David A. Kraft, Director

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No more Chornobyls! No more Fukushimas!

Invest in a nuclear-free world -- today!

0178

Comment: Two comments on the EPA PAGs:

There is now much information coming from the Japanese and the World Health Organization (WHO) on the impact of the "relocation" of thousands of people who lived in the vicinity of the Fukushima Daiichi NPP after the plant was damaged by the Great Eastern Japan Earthquake and Tsunami. This incident has shown how large the loss of life is when such relocation occurs. Relocation was done due to concern about potential radiation exposure, however many organizations have reported that the actual potential for long-term effects was low. The effects of evacuation, however, were real and immediate. This new example and learning should be used to inform decisions and guidance about when to evacuate and relocate people. In addition, the National Council on Radiation Protection and Measurements (NCRP) is about to issue a report that directly addresses a number of issues associated with the EPA Protective Actions Guides (PAGs). The report to be published within a few months, entitled, "Decision Making for Late-Phase Recovery from Nuclear or Radiological Incidents" will provide a wealth of scientifically-based information that should be useful to the process of finalizing the revised PAGs.

Secondly, this document describes the 5 rem (occupational limit), the 10 rem (suggested dose to save valuable property) and the 25 rem (suggested dose to perform life-saving operations). It does not discuss the possibility that even higher doses could be received by emergency responders performing what NCRP Report No. 165, "Responding to a Radiological or Nuclear Terrorism Incident: A Guide for Decision Makers" calls "Time-Sensitive Mission-Critical" activities that could result in radiation doses higher than 25 rem. NCRP Report No. 165 expands the discussion on a Decision Dose of 50 rad. The concept of Decision Dose was addressed first in NCRP Commentary No. 19. It describes its use, by the Incident Commander, as a tool to address the need to and the consequences of exposing emergency responders to higher doses to accomplish those Mission Critical situations. This is especially important in an Improvised Nuclear Device (IND) incident. These potential higher exposures to emergency responders need to be addressed upfront in the PAGs so both the people writing radiological/nuclear emergency response plans and the incident commanders who use the plans are aware of the recommendations made by NCRP and others.

Debra McBaugh Scroggs

It is high time the Linear Non-Threshold hypothesis was abandoned. It cannot, by its very nature, be proven, since increased cancer risks of small effect can't be distinguished from general cancer statistics. On the other hand, there is abundant evidence that small amounts of radiation are either harmless or even beneficial. This is not only statistically sound but blatantly obvious, since many areas of the earth have orders of magnitude more naturally-occurring background radiation than others. If LNT were valid, we would see obvious elevated risks of cancer at those locations, but in fact we see nothing of the sort. We would also expect to see greatly elevated cancer rates among flight crews, who receive far more radiation than normal on a very regular basis. This, too, is not in evidence.

The embrace of LNT by regulators has served to cripple the nuclear power industry with onerous and costly regulations that have no basis in actual risk assessment. Policy makers must resist the tendency to surrender to public opinion on the matter, since this is a question of science, not public sentiment, the latter being woefully ignorant of the facts and bamboozled by decades of fear-mongering. This very exercise of soliciting public comment—and the thousands of comments already received—bodes ill for a science-based result. Will these comments simply be sorted according to sentiment with the most popular view winning the day? That would be a travesty of governance.

These regulations have serious ramifications for the nuclear industry, and using sound science to ease restrictive regulations that have been based on irrationality is the proper course of action. Climate change is perhaps the most serious challenge mankind has faced in human history, and without abundant nuclear power we stand no chance of meeting that challenge.

Many believe that all the energy humanity demands can be supplied with so-called renewables, primarily wind and solar. The assertions most often cited for this fantastical view are from papers by Jacobson & Delucci, of Stanford and U.C. Davis, respectively. Yet their study is flawed in ways that are almost ludicrous to contemplate. For one thing, they posit that humanity will use far less energy in the future, ignoring the fact that we will likely have ten billion people on the planet by mid-century. Even the basic requirement of providing fresh water for so many people will require vast amounts of energy, since most of it will have to come from desalination (and be moved to where it's needed). They also seem oblivious to the fact that billions live in relative energy poverty today, and even more billions will be striving to raise their standard of living to western standards.

Germany is often pointed to as a model for all-renewables advocates, with about as much factual evidence as the LNT hypothesis. But for the moment let's ignore the fiasco that is German energy policy and just look at their energy use. The country is perhaps the most advanced when it comes to embracing energy efficiency measures, and at the same time they have retained a lot of their industry instead of offshoring it like many other countries. They use slightly more than half the energy per capita per annum compared to the USA. So let us imagine a not too distant future where ten billion people consume as much energy as today's average German. We'll call that the high-energy planet scenario. How much land would that require?

If we use J&D's own data, the land area needed for wind turbines and solar panels would be equal to the entirety of South America! That also happens to be the amount of land currently planted with crops globally, both annuals and tree crops (but excluding all grazing land). Now consider that entire vast continent covered with wind turbines and solar panels (woe to all bird and bat life) when compared to a world that derives all its energy from nuclear power. Let's use the land footprint of the Westinghouse AP1000 reactor for comparison, a new passively-safe design that's being built today in both China and the USA. If we were to provide all the energy humanity needs for ten billion people on a high-energy planet, all the AP1000 power plants necessary to provide that energy could fit within the metro area of Buenos Aires, Argentina with room to spare!

I relate these simple facts to illustrate the absolute need to encourage the deployment of nuclear power to address the climate change challenge. Enacting regulations based on sound science rather than fear and ignorance is an important step. Please consider the scientific realities, not the number of fearful people who have bothered to add their comments. If we make energy policy a popularity contest, we will all be the losers.

Tom Blees
President, The Science Council for Global Initiatives

0188

The new Protective Action Guides are a positive step in the right direction toward improved public protection in the event of a radiation related event. It is good to provide public officials and first responders with clear guidance that will help them to calm the fears of a public that has been taught to be afraid of that which they cannot see, smell or touch.

They do not go far enough, however, in that they still rely on overly conservative exposure limits. They still result in the potential for initiating unnecessary and hazardous movement of large numbers of people to avoid trivially small exposures.

Lengthy and detailed studies have been undertaken on large samples of humans that have been accidentally or purposely exposed to ionizing radiation from both external sources and ingested radioactive material. Those studies all point to the conclusion that there is no measurable increase in harm or cancer risk for any exposure that is less than about 100 mSv.

Damage from low doses does not appear to accumulate due to adaptive response and other biological repair mechanisms. As a result, a growing number of radiation health specialists and researchers like Wade Allison, Myron Polycove, Jerry Cuttler, and Ludwig E. Feinendegen have determined that humans can withstand repeated or chronic exposures as long as they are given at a rate less than about 100 mSv per month. That is slow enough to allow the repairs to work well.

When bad things happen, one of the most important things that public officials and first responders can do is to provide calm direction that helps people to avoid real hazards. After the event happens, it is important to apply all of the knowledge that we have accumulated in order to restore areas back to their pre-event productivity and economic activity. Disrupted lives or lives spent trembling in fear can lead to numerous negative health effects that are far more real and measurable than the imaginary negative health effect of low dose radiation.

Rod Adams
Publisher, Atomic Insights
Host and producer, the Atomic Show podcast

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The Honorable Gina McCarthy, Administrator
U.S. Environmental Protection Agency
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September 16, 2013

Re: Protective Action Guides for Radionuclides
(Docket ID No. EPA–HQ–OAR–2007–0268)

Dear Administrator McCarthy:

On September 11 and 12, *National Journal* issued two investigative news articles[i] raising troubling questions about the conduct of EPA personnel in appearing to work at cross purposes to EPA radiation protection policies. EPA documents released by the *Journal* indicate some EPA staff have been making presentations on behalf of the agency that appear to suggest it is EPA policy that there may be levels of radiation that are not harmful and may in fact be good for you ("hormesis"), that EPA policy allows disposal of "low-level" radioactive waste in other than licensed radioactive waste facilities or by release into the commercial recycling stream; and that the agency's CERCLA standards should be ignored.

The articles also raise questions whether the new Protective Action Guides (PAGs) for responding to radiological releases and issued for public comment involve a kind of "bait and switch." The public was asked to comment on PAGs that do not contain the controversial provisions of "optimization" and reliance on exceedingly lax "benchmarks" for long-term cleanup initially put forward by the Bush Administration but withdrawn by the Obama Administration. However, EPA staff, in documents obtained by the *Journal*, says they are acting as though those provisions were still in effect.

I enclose the articles, ask that they be part of the record on the PAGs, and request that you take action to assure that your personnel carry out the agency's policies on radiation protection rather than work to undermine them.

Sincerely,

Diane D'Arrigo
Nuclear Information & Resource Service
301 270 6477 x 15, dianed@nirs.org

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[i] http://www.nationaljournal.com/global-security-newswire/epa-documents-raise-doubts-over-intent-of-new-nuclear-response-guide-20130911?mrefid=mostViewed; http://www.nationaljournal.com/global-security-newswire/does-u-s-advice-on-disposing-fukushima-waste-apply-back-home-20130912

Comments on Revision to PAG Manual

Comment No.	Page	Section	Subject	Paragraph or Location	Comment
Requested Comments on Specific Issues					
1		Entire Manual	Use of FRMAC Methods		Agree that using the FRMAC Methods is most appropriate and will allow easy update of dose parameters as new information is discovered. It is NOT appropriate to include tables from the FRMAC Assessment Manual as that will have the negative effect of "codifying" whatever tables are inserted and making it much more difficult to ensure the most up-to-date methods are employed. It is, however, important that knowledgeable dose assessment personnel use the information with an understanding of the assumptions made by FRMAC so that modifications for specific incidences can be intelligently made.
2		Entire Manual	Short-term emergency drinking water guide		A short-term, emergency drinking water guide is appropriate and should be developed.
3		Entire Manual	1998 Food Guidance		Although comments are not requested, how have changes in internal dosimetry affected the calculations? Also, the PAG Manual should write the reference to the food guidance so that future changes can easily be incorporated without having to again change the PAG Manual.
4		Chapter 2	Use of KI for the public		Agree that this is appropriate for ease of implementation for PUBLIC actions. More emphasis is needed to ensure that KI use is not used in place of evacuation. See comment 18 for additional concerns.
5		Chapter 2	Removal of skin and thyroid evacuation thresholds		It is NOT appropriate to remove the skin and ORGAN evacuation thresholds. For some accident types (especially those with a single radionuclide that may pose an internal hazard), the organ dose may be more limiting than the whole body effective dose.
6		Chapter 3	Removal of 5 rem over 50 year relocation PAG		It is appropriate to specifically exclude the 50 year relocation PAG (especially in light of the lessons learned during the Fukushima response).
7		Chapter 3	Guidance on reentry		Helpful.
8		Chapter 3	Develop combined Intermediate Phase PAG (for all pathways)		It is NOT appropriate to combine the food pathway with the groundshine and inhalation (of resuspended material) pathways since the protective actions are so different. The food pathway PAGs are designed to stop ingestion of a contaminated food no matter where the consumer may be. However, as noted in section 3.4.2 (page 41, last paragraph of section), relocation may

Comment No.	Page	Section	Subject	Paragraph or Location	Comment
					be necessary based on ingestion dose if another food source cannot be assured.
9		Chapter 4	Usefulness of cleanup guidance		Helpful.
10		Chapter 4	Merging of 2008 RDD-IND planning guidance		Appropriate.
11		Chapter 4	Radioactive waste disposal planning guidance		Helpful.
General Comments					
12			PAG Development		The PAGs have not numerically changed from the 92 Manual; however, better knowledge (from Fukushima response) of the risks associated with evacuations and relocations may require a re-evaluation of the risk/benefit of these actions at the stated PAG levels. The PAGs may need to be increased.
13	Multiple		Use of FRMAC Methods		Update all references to December 2013 FRMAC Assessment Manual.
14	1	1.1	Protective actions	List of protective action examples	Include relocation; especially since in also goes along with the water and food info.
15	4	1.3.4	Key changes	Last ¶, last sentence	"All other PAGs and corresponding protective actions from the 1992 PAG Manual remain unchanged." - Not true. Have removed the thyroid and skin PAGs (specific organs).
16	5	1.3.4		First ¶, next to last sentence	Left off the "." to end the sentence.
17	7	1.4.1	EPZ sizes	¶ under table 1-1	May want to make this less prescriptive of the 10-mile and 50- mile EPZ since these are under review for Small Modular Reactors (SMRs); also, the distances are approximate and should include considerations for political and geographical boundaries.
18	7	1.4.1	Clarification needed	Table 1-1	• Drinking water PAG will need to be inserted in this table. • Footnote for food PAG should allow possible future changes. • Footnote for KI use should allow possible future changes. • For the KI PAG – need to be clear that the FDA guidance is different for different age groups and "circumstances" but that for simplicity EPA has adopted the 5 rem projected child thyroid dose. Does not and should not be applied to a nursing home that cannot evacuate and has no children in it. (I.e., this is too prescriptive.)
19	13	2.2	Exposure	Bulleted list	• Add "As noted above, deposited

Comment No.	Page	Section	Subject	Paragraph or Location	Comment
			pathways; clarification needed		material may also be resuspended into the breathing zone and contribute to the inhalation dose" to the deposition bullet. • This whole section will be confusing when looking at the FRMAC assessment method since they talk about 4-pathways and it looks, at first glance, like only three here. For clarity, have two sub-bullets under "inhalation" separating out the plume and resuspension pathways. • Deposition bullet, 2nd sentence, remove "to skin and internal body organs" – confusing.
20	13	2.2	Exposure pathways; clarification needed	Last ¶, 2nd sentence	The use of the word "groundshine" here seems to mix the internal and external components of exposure. Clarify.
21	14	2.2	Exposure pathways; clarification needed	First ¶, last sentence	• Add "(approximate 1 meter; waist-level)." • Add "but may be included for completeness." Especially important since FRMAC makes such a big deal of including the resuspension inhalation dose. • May also consider adding at the end of the paragraph "For example, the dose from inhalation of resuspended materials is much less than 10% for intakes during the early phase; however, it may be included in the methods used to calculate the total dose for that period."
22	15	2.2.1	Clarification needed	First ¶, first line	Confusing to lay person; consider adding "until the center of the plume is at ground level" after "from the source".
23	15	Table 2-1	PAGs	Sheltering-in-place/ evacuation PAG	Should include organ dose PAG (5 rem); it may be limiting in some cases. (See comment 5.)
24	15	Table 2-1	KI use	KI use	Need to include (in footnote) that this level was chosen for simplicity of implementation and that for special populations (such as a nursing home), other values may be more appropriate.
25	15	Table 2-1	Clarification needed	Footnote b	Include "plume submersion" with the groundshine because this implies no direct plume exposure.
26	15	Table 2-1		Footnote d	Refers to incorrect section, should be section 2.3.4.
27	16	2.3.1	Sheltering-in-place vs. shelter or sheltering	Entire section	Need to be careful to use "sheltering-in-place" and not "shelter" or "sheltering" – there are some very distinct definitions that need to be adhered to throughout this section. Define "shelter" – it is used here to mean mass care centers or something of that nature. This section needs to be crystal clear on the difference between "sheltering-

Comment No.	Page	Section	Subject	Paragraph or Location	Comment
					in-place" and "shelter." In fact, it would be best to use some other term instead of shelter; but, too many other agencies are using "shelter."
28	16	2.3.1	Clarification needed	First ¶, next-to-last sentence	Sentence needs a little more explanation – such as "because the air inside a vehicle rapidly equalizes with the outside air even when all of the windows and vents are closed."
29	16	2.3.1	Clarification needed	First ¶, last sentence	"Seldom" or never?
30	16	2.3.1	Clarification needed	Second ¶, last sentence	This is the first place where the IND guidance is referenced. Seems to need a bit more explanation. Actually seems out of place here the way it is.
31	17	2.3.2	Clarification needed	Sheltering-in-place list	"e.g." stuff should all be in parentheses.
32	17	2.3.2	Organ dose PAG	Last major bullet (about radioiodine or particulates)	If this is true (inhalation dose may be a controlling criterion for protective actions), why has the Committed Equivalent Dose (to an organ) PAG been eliminated?
33	19	Figure 2-1	Clarification needed		Confusing – is this dose reduction from DEPOSITED material or material that is still in the air?
34	20	2.3.4	Clarification needed	5th ¶	Define "neonates."
35	20	2.3.5	EPZ sizes	1st ¶	Default EPZ size are approximate – this is written as absolutes. Also, sizes may be different for SMRs (like they were for Big Rock Point).
36	21	2.3.5		1st ¶ on page	Footnote "10" seems to be in the wrong place – applies more to the 2nd paragraph since is addresses "other type of nuclear facility."
37	21	2.3.5		2nd ¶ on page, last sentence	Remove "," after EPZs (it doesn't belong).
38	22	2.4	Clarification needed	Entire ¶	• External exposure to the plume AND ground deposition (left out the deposition). • FRMAC does NOT have a method, at this time, of determining thyroid dose using their manual! • Whole paragraph needs to be rewritten to clarify it. • Question for FRMAC – uses the most restrictive lung clearance for Cs; why don't they use vapor for I?
39	23			Footnote 13	Incorrect reference to footnote 7 – should be footnote 10.
40	24	2.4.3	Clarification needed	2nd ¶	FRMAC includes many Dose Conversion Factors and then LOTS of other dose parameters – this will be really confusing for someone looking in their manuals. There are just so many things used in FRMAC – somehow need to get this across. May help to list some of the variables that have to be considered in the 1st paragraph (such as particle size, deposition velocity,

Comment No.	Page	Section	Subject	Paragraph or Location	Comment
					resuspension factor, weathering factor, etc.).
41	24	2.5	Clarification needed	Entire section	Emphasize that lowest dose limit should always be used – higher levels require planning and KNOWLEDGE. When doing intermediate phase work (such as taking environmental samples), the dose limit is the OCCUPATIONAL limit – NOT these emergency limits.
42	24 and 25	2.5 and 2.6	Clarification needed	Entire sections	Using "emergency worker" and "response worker" and "emergency responders" interchangeably yet there is a difference in how these people should be used and their doses controlled. Should probably define exactly what is meant – this is an area that was muddled in the 92 PAG Manual. It should be clarified. Should also include worker dose control in Chapter 3 (Intermediate phase) to ensure that occupational levels are used.
43	25	2.5		2nd ¶ (1st full ¶)	Update references for FRMAC Health and Safety Manual (2012 version).
44	30 – 32	2.7 and 2.8	Contamination control	Entire sections	Lazy version of contamination control. Should be risk based. Use guidance from FEMA-REP-21/22 and other more recent documents to determine guidance. CDC is lacking specific guidance. Specific guidance is needed to ensure scientific concerns are appropriately addressed. By continuing to use the 2 x background action level (which was only used as a place holder until risk based levels could be determined), the "irrational fear of radiation" endures. May need to perform additional calculations and experiments for the other radionuclides in the FRMAC list to ensure that the levels specified in FEMA-REP-21/22 are acceptable for other radionuclides. Also need to consider alpha contamination.
45	35	3.3	Clarification needed	5th ¶	Change first sentence to: In most scenarios, relocation decisions will be based on doses from external exposure to the whole-body from deposited materials and internal exposure from inhalation of resuspended contamination.
46	36	Table 3-1	PAG for simple dose reduction techniques	< 2 rem	Include "in the first year."
47	42	3.4.4	Emphasis needed	Exposure limits for re-entering relocation area	Emphasize that people entering the relocation area to WORK are to be controlled as occupational workers and not emergency workers.
48	47	3.8	Re-entry matrix	PAG levels	Change units back to "rem" instead of "mrem" OR change the PAG values in sections 2 and 3 to "mrem." It is confusing to change the units for this matrix.

RALPH L. ANDERSEN, CHP
Senior Director, Radiation Safety and
Environmental Protection

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NEI
NUCLEAR ENERGY INSTITUTE

September 16, 2013

Air and Radiation Docket and Information Center
U.S. Environmental Protection Agency
Mail Code: 6102T
1200 Pennsylvania Avenue NW
Washington, DC 20460
ATTN: Docket ID No. EPA-HQ-OAR-2007-0268

Subject: Request for Comment on Updates to Protective Action Guides Manual: Protective Action Guides and Planning Guidance for Radiological Incidents, 78 Federal Register 22257, April 15, 2013

On behalf of the nuclear energy industry, the Nuclear Energy Institute (NEI)[1] provides the following comments in response to the subject Federal Register notice (FRN). These comments were developed by a group of industry experts in the areas of emergency preparedness and radiological protection drawn from the staff of companies that own and operate nuclear power reactors in the U.S. Our general comments are shown below and more detailed comments in response to specific questions posed in the FRN are included in the attachment.

America's nuclear energy facilities are designed and built to safely withstand a wide variety of natural and other severe events and are staffed around-the-clock by highly trained, federally licensed operators who are capable of taking the on-site actions necessary to mitigate and control the potential consequences of such events. Every U.S. nuclear power plant has a detailed emergency response plan developed in concert with local, state and federal government agencies, as well as local law-enforcement, fire-fighting and medical emergency response organizations, to protect public health and safety. Plant personnel that make up the facility's emergency response team, along with local first-responders, are continuously trained and drilled to maintain a high state of readiness to carry out the emergency response plan. All nuclear energy facilities participate in federally-evaluated, full-scale emergency response exercises every two years to identify and incorporate any needed improvements in the emergency response plans.

[1] The Nuclear Energy Institute (NEI) is the organization responsible for establishing unified industry policy on matters affecting the nuclear energy industry, including the regulatory aspects of generic operational and technical issues. NEI's members include all entities licensed to operate commercial nuclear power plants in the United States, nuclear plant designers, major architect/engineering firms, fuel cycle facilities, nuclear materials licensees, and other organizations and entities involved in the nuclear energy industry.

Protective action guides (PAGs) have been in effect for many years and play a key role in nuclear power plant emergency plans. PAGs for protecting public health and safety during the initial phase of an emergency event have been incorporated into each nuclear power plant's emergency plan since the time that the PAGs were established in 1980 and the emergency plans were updated when the PAGs were revised and expanded in 1992. The PAGs in the current emergency plans cover near-term protective measures such as sheltering, evacuation, administration of potassium iodide and setting restrictions on food and drinking water. Nuclear power plant emergency plans require that plant operators be able to make recommendations for protecting the public (based on the PAGs) to local and state authorities within 15 minutes of determining that an emergency event might result or has resulted in a significant radiological release. This capability is practiced and tested in the numerous drills and exercises conducted by plant staff and in conjunction with local, state and federal organizations.

The subject FRN conveys the most recent revision to the PAG manual that not only further updates the existing PAGs for the initial phase of an emergency, but also introduces PAGs for consideration of longer-term protective measures such as relocation, re-entry and recovery.

In forming our comments, we note that the updated PAG manual is intended to encompass "an expanded range of sources of potential radiological releases, including commercial nuclear power facilities, uranium fuel cycle facilities, nuclear weapons facilities, transportation accidents, radiopharmaceutical manufacturers and users, space vehicle launch and reentry, RDDs [radiological dispersion devices] and INDs [improvised nuclear devices]." We fully support such a comprehensive and integrated approach. Regardless of the specific circumstances that may be associated with different types of radiological emergencies, the radiation dose-based criteria used in protective action decision-making should be uniform and consistent to support effective and efficient planning, preparation and response to radiological emergencies.

In summary, we find that the updates to the PAG manual provide a more comprehensive and enhanced framework for decision-making during a radiological emergency that will continue to meet the essential principles for protecting public health and safety (as stated in the FRN) that underlie effective emergency planning, preparedness and response:

1. Prevent acute [radiological health] effects
2. Balance [radiological] protection with other important factors and ensure that actions result in more benefit than harm
3. Reduce risk of chronic [radiological health] effects

In developing and using the PAG manual, we believe that it is especially important to reinforce the essential principle of "balance" (#2 above) to help ensure that protective actions result in more benefit than harm. This importance was highlighted by the events in Japan following the earthquake, tsunami and nuclear accident in 2011. Some of the decisions taken for a single purpose (in this case, with the primary intent to protect against radiation exposure) were extremely disruptive and may have resulted in more social harm than good – as recognized in recent publications regarding radiological protection issues and health risks associated with the Fukushima nuclear reactor accident[2,3]

The principle of balance is recognized, at least in part, in the PAG manual guidance for the late phase and in Department of Homeland Security-sponsored guidance being developed by the National Council on Radiation Protection and Measurements. We strongly endorse both efforts aimed at taking a more holistic approach to assessing protective options and empowering those who will be affected to participate more directly in decision-making. We suggest that this principle can also be more fully incorporated into the intermediate phase guidance related to relocation, reentry, and food and drinking water.

The PAG manual criteria include 2 rem in the first year and 500 mrem in subsequent years for relocation and reentry and highlight the Safe Drinking Water Act criteria for drinking water (e.g., 4 mrem per year for beta-gamma emitting radionuclides). These criteria are on the conservative end of comparable guidance from the ICRP[4] that includes a range of 2-10 rem in a year for "unusual, and often extreme, situations where actions taken to reduce exposures would be disruptive" and are substantially less than the 10 rem per year criterion recommended by the International Atomic Energy Agency[5] [IAEA General Safety Guide GSG-2]. The ICRP and IAEA criteria apply to all-pathways of exposure.

We suggest setting a range of 2-10 rem per year for all anticipated pathways of exposure (inclusive of consumption of food or drinking water) which would greatly provide enhanced flexibility for balancing avoidance of potential radiological health risks with risks and impacts associated with disruptive protective actions. In extreme and exigent situations where the use of contaminated food or water may be unavoidable (e.g., in the aftermath of a natural disaster or terrorist event that results in significant damage to critical infrastructure), an all-pathways approach will provide more-informed options for decision-making. In most other cases, where contaminated food and water can be effectively quarantined, the range would apply more exclusively to decision-making based on projected external exposure and inhalation of radionuclides.

We fully support implementation of the PAGs using the latest science by referring to dose calculations in the Federal Radiological Monitoring and Assessment Center (FRMAC) assessment manuals. The FRMAC assessment manuals utilize the radiation dosimetry models and dose coefficients recommended by the International Commission on Radiological Protection (ICRP) that reflect the most up-to-date scientific consensus on radiation units, quantities and methods and form the basis for global radiation safety standards,

---

[2] Gonzales, Abel J. et al. Radiological Protection Issues Arising During and After the Fukushima Nuclear Reactor Accident. J. Radiol. Prot. 33(497-571), IOP Publishing, Bristol (2013)
[3] World Health Organization. Health Risk Assessment from the Nuclear Accident after the 2011 Great East Japan Earthquake and Tsunami. World Health Organization, Geneva (2013)
[4] International Commission on Radiological Protection (ICRP). The 2007 Recommendations of the ICRP. ICRP Publication 103, Ann. ICRP 37(2-4), Elsevier, Amsterdam (2007)
[5] International Atomic Energy Agency (IAEA). Criteria for Use in Preparedness and Response for a Nuclear or Radiological Emergency. General Safety Guide No. GSG-2, IAEA, Vienna, 2011

e.g., as adopted and endorsed by the International Atomic Energy Agency, World Health Organization, International Labor Organization, International Radiation Protection Association and others. Reference to the FRMAC assessment manuals will help facilitate standardization in radiation data collection, sharing and analysis, better uniformity between jurisdictions and for trans-boundary situations (e.g., between states and with neighboring countries) in considering protective actions, and more consistent and less error-prone communications between organizations and with the public.

We recognize and support incorporation of updated Food and Drug Administration (FDA) recommendations on the use of potassium iodide (KI) with a recommended protective action guide threshold of 5 rem projected child thyroid dose for administration of KI. We also support removal of the skin and thyroid dose criteria for considering evacuation "to avoid confusion with the KI threshold." However, in combination these two changes create the potential for scenarios in which KI administration might be recommended without a concurrent recommendation for evacuation or sheltering-in-place because the respective whole body dose threshold would not be projected to be exceeded. This approach appears to be a departure from past practice in which the administration of KI has been considered as a supplemental action to the primary protective actions of evacuation and sheltering-in-place. Additional discussion should be provided in the PAG manual to better clarify the intended priority and sequencing of protective actions for such scenarios.

Finally, we appreciate the stated objective to "streamline the manual to enhance usability." We believe that much will be learned in regard to the manual's usability during its actual implementation by state and local governments and other stakeholders. We suggest that the EPA consider establishing a means to obtain and address stakeholder feedback during the implementation period.

We appreciate the opportunity to provide our comments on the updated PAG manual. If you have any questions regarding our comments, please feel free to contact me.

Sincerely,

Ralph Andersen

Ralph L. Andersen

Attachment

"ANDERSEN, Ralph"
<rla@nei.org>
09/16/2013 02:03 PM

To Undisclosed recipients:;

cc

bcc

Subject Request for Comment on Updates to Protective Action Guides Manual: Protective Action Guides and Planning Guidance for Radiological Incidents

The attached cover letter contains complete contents of the letter.

September 16, 2013

Air and Radiation Docket and Information Center
U.S. Environmental Protection Agency
Mail Code: 6102T
1200 Pennsylvania Avenue NW
Washington, DC 20460
ATTN: Docket ID No. EPA-HQ-OAR-2007-0268

Subject: Request for Comment on Updates to Protective Action Guides Manual: Protective Action Guides and Planning Guidance for Radiological Incidents, 78 Federal Register 22257, April 15, 2013

On behalf of the nuclear energy industry, the Nuclear Energy Institute (NEI)[1] provides the following comments in response to the subject Federal Register notice (FRN). These comments were developed by a group of industry experts in the areas of emergency preparedness and radiological protection drawn from the staff of companies that own and operate nuclear power reactors in the U.S. Our general comments are shown below and more detailed comments in response to specific questions posed in the FRN are included in the attachment.

America's nuclear energy facilities are designed and built to safely withstand a wide variety of natural and other severe events and are staffed around-the-clock by highly trained, federally licensed operators who are capable of taking the on-site actions necessary to mitigate and control the potential consequences of such events. Every U.S. nuclear power plant has a detailed emergency response plan developed in concert with local, state and federal government agencies, as well as local law-enforcement, fire-fighting and medical emergency response organizations, to protect public health and safety. Plant personnel that make up the facility's emergency response team, along with local first-responders, are continuously trained and drilled to maintain a high state of readiness to carry out the emergency response plan. All nuclear energy facilities participate in federally-evaluated, full-scale emergency response exercises every two years to identify and incorporate any needed improvements in the emergency response plans.

Attachment

Ralph L. Andersen, CHP

Senior Director, Radiation Safety & Environmental Protection

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nuclear. clean air energy.

---

[1] The Nuclear Energy Institute (NEI) is the organization responsible for establishing unified industry policy on matters affecting the nuclear energy industry, including the regulatory aspects of generic operational and technical issues. NEI's members include all entities licensed to operate commercial nuclear power plants in the United States, nuclear plant designers, major architect/engineering firms, fuel cycle facilities, nuclear materials licensees, and other organizations and entities involved in the nuclear energy industry.

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09-16-13_EPA_Comments on Updates to Protective Action Guides for Radiological Incidents_Attachment.pdf

Detailed Comments on EPA PAG Manual 2013

Nuclear Energy Institute (NEI)

Dose Modeling Methods

- NEI concurs with the EPA approach to use ICRP-60 dose modeling methods and concurs with the use of FRMAC method to the extent dose modeling uses ICRP-60 principles
- The PAG Manual values for the Early Phase (Table 2-1) and Intermediate Phase (Table 3-1) differ significantly from corresponding international criteria recommended by the International Atomic Energy Agency.[1] The PAG Manual includes a range of 1-5 rem for consideration of early phase evacuation or sheltering-in-place compared with the international criterion of 10 rem (based on a reference level range of 2-10 rem) and intermediate phase values for relocation and other dose reduction actions of 2 rem in the first year and 0.5 rem in subsequent years compared with the international criterion of 10 rem per year. The PAG Manual and international recommendations share similar underlying principles for criteria for protective actions, e.g., to avoid acute health effects and to reduce the risk of chronic health effects. Even considering potential differences in how the protective action criteria might be applied, e.g., calculation methods and pathway selection, the PAG Manual values appear to be decidedly conservative when compared to international criteria. We suggest that the EPA should evaluate and rationalize the differences between the PAG Manual values and current[2] international criteria as an appropriate enhancement to the basis for the early and intermediate phase PAGs.
- NEI concurs with the concept of not evaluating unavoidable dose that occurs prior to the point at which protective actions are initially considered.

Drinking Water PAGs

- Protective action decisions related to drinking water occur in the Intermediate and Late Phases and generally not in the early phase of an event. These are often referred to as the Reentry and Reoccupation phases. As such, the PAG values should reflect longer exposure times than are likely to occur in Phase 1 and populations that are likely to extend beyond the emergency planning zones (EPZs) for nuclear power reactors as described in NUREG 0396. Furthermore, the PAGs for drinking water should reflect the nature of the conditions as an emergency and recognize the distinction between responses and protective actions in different phases of the response.
- NEI does not support the EPA conclusion that it is not necessary to offer specific dose or concentration guidelines for drinking water in the PAG Manual 2013. Instead, EPA recommends use of the National Primary Drinking Water Regulations (NPDWR). The NPDWR values are appropriate for on-going, lifetime exposures in non-emergency, normal life conditions. Clearly, Phases 1 (acute) and 2 (reentry / recovery) are special and highly unusual circumstances for which routine drinking

[1] International Atomic Energy Agency (IAEA). Criteria for Use in Preparedness and Response for a Nuclear or Radiological Emergency. General Safety Guide No. GSG-2, IAEA, Vienna, 2011

[2] Note that the only reference in the PAG Manual to international criteria is in regard to a 1989 version of IAEA recommendations.

water characteristics described in the NPDWR should not be imposed. Only in Phase 3 (reoccupation) is it reasonable to consider normal drinking water limits for radionuclides as found in the NPDWR. Drinking water data for radionuclides in the NPDWR are designed for municipal water systems that provide the sole source of drinking water to large populations. Thus, the NPDWR concentration limits are designed to achieve doses orders of magnitude lower than those for which any health effects have been observed. The NPDWR drinking water concentration limits are largely based on the concept of the Linear Non-Threshold Theory (LNT) which is not appropriate for protective actions in emergency responses. Thus, EPA should make specific recommendations that are based on avoidance of long-term health effects in Phases 2 and 3. The recommended values for drinking water in Phase 2 and 3 emergency responses should be developed using dosimetric methods that may consider but should not rely upon LNT theories. Empirical health effects data from actual radiological contamination experience of drinking water should be used in informing the development of radionuclide specific guidance for Phase 2 and Phase 3 conditions for the various types of events considered (nuclear reactor accidents, radioactive dispersal devices, and improvised nuclear devices). Event specific radionuclide guidance is appropriate because the source terms (isotopes) are very different from one type event to the other.

Use of Potassium Iodide (KI)

- Reliance on the Chernobyl experiences as a basis for United States PAGs may be somewhat misplaced given that the national and local authorities did not take early action to inform the public of the nature of the event and to interdict certain food sources. We anticipate that in the United States, unlike in the case of Chernobyl, the public would be informed early and sources of radioactive iodine in food and water would be identified promptly and interdiction actions taken.

Skin and Thyroid Dose Evacuation Criteria

- Skin related exposures are bounded by whole body doses when considering potential accidents from nuclear power reactors. As such, no special evacuation criteria are necessary for exposures arising from events at nuclear power reactors.

Eliminating 5 rem over 50 year Relocation Guidance

- Decisions on long-term relocation and reoccupancy are exceedingly complex and must consider a wide variety of factors. Projected radiation dose is an important consideration, however, factors such as the potential economic and societal benefits from reoccupancy should be considered.
- Due to the complexity of such decisions, simple guidance might be offered in a PAG Manual is insufficient. PAGs for long-term relocation and reoccupancy can reasonably be addressed at the time of an event taking into consideration the unique aspects of the circumstances.

Usefulness of Combined Pathways for Dose Modeling

- We believe that the use of FRMAC assessment methods that rely upon current ICRP recommendations for external whole body and internal dose determination is appropriate.
- The use of the concept of Total Effective Dose Equivalent (TEDE) is an appropriate measure of radiation exposure risk that is well understood.

Remediation Guidance

- General guidance as provided in Chapter 4 of the draft PAG Manual is reasonable. The Manual appropriately recognizes that remediation decisions must take into account a wide variety of factors which may not be described analytically in advance of a particular event.

Waste Disposal Guidance

- The introduction of issues and discussion of a range of actions is appropriate for this Manual. However, the document states that state governments are responsible for waste disposal. This is an unreasonable assignment of responsibility for events involving significant contamination of land or structures. This topic deserves separate and more extensive discussion between federal, state and local governments and other stakeholders that is well beyond the process of producing this update to the PAG Manual.

Exelon Generation.

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September 12, 2013

SEP 17 2013

U.S. Environmental Protection Agency
Air and Radiation Docket and Information Center
Mail Code: 6102T
1200 Pennsylvania Ave NW
Washington, DC 20460
Attn: Docket ID EPA–HQ–OAR–2007–0268

Subject: Comments Concerning Updates to Protective Action Guides Manual: Protective Action Guides (PAGs) and Planning Guidance for Radiological Incidents (78FR22257, dated April 15, 2013, Docket ID EPA–HQ–OAR–2007–0268)

This letter is being submitted in response to the U.S. Environmental Protection Agency (EPA) request for comments concerning *"Updates to Protective Action Guides Manual: Protective Action Guides (PAGs) and Planning Guidance for Radiological Incidents,"* which was published in the *Federal Register* on April 15, 2013 (i.e., 78FR22257).

As part of EPA's mission, EPA publishes PAGs to help Federal, State, local, and tribal emergency response officials make radiation protection decisions during emergencies. The EPA, in coordination with a multi-agency working group within the Federal Radiological Preparedness Coordinating Committee (FRPCC), has proposed updates to the "1992 Manual of Protective Action Guides and Protective Actions for Nuclear Incidents" (i.e., 1992 PAG Manual - EPA 400–R–92–001, May 1992). The updated guidance contained in the revised 2013 PAG Manual, *"Protective Action Guides and Planning Guidance for Radiological Incidents,"* applies the PAGs to incidents other than just nuclear power plant accidents, updates the radiation dosimetry and dose calculations based on current science, and incorporates late phase guidance.

Exelon Generation Company, LLC (Exelon) appreciates the opportunity to comment on the proposed updates to the PAG Manual. Exelon supports the comments submitted by the Nuclear Energy Institute (NEI) on behalf of the industry related to this subject.

Respectfully,

D. P. Helker

SEP 12 2013

David P. Helker
Manager, Licensing and Regulatory Affairs
Exelon Generation Company, LLC

To: Christ, Lisa[Christ.Lisa@epa.gov]; Ellis, Jerry[Ellis.Jerry@epa.gov]
From: Hernandez-Quinones, Samuel
Sent: Thur 1/23/2014 6:36:08 PM
Subject: RE: Is 1/24 okay for draft Water brief mat'ls?
Grevatt Briefing PAGs Feb 2014.docx

Hi Lisa,

Please see attached file.

Let me know if you would like me to add anything else.

Sam

From: Christ, Lisa
Sent: Thursday, January 16, 2014 12:05 PM
To: Hernandez-Quinones, Samuel; Ellis, Jerry
Subject: FW: Is 1/24 okay for draft Water brief mat'ls?

Sam & Jerry –

Please let me know you can prepare briefing materials for an update on the development of options for a Rads PAG by COB January 21? That would allow me time to review and time to schedule a briefing with Eric late January. If you need more time let me know so I can advise Sara.

Thanks-

Lisa

From: DeCair, Sara
Sent: Thursday, January 16, 2014 12:01 PM
To: Christ, Lisa
Subject: Is 1/24 okay for draft Water brief mat'ls?

So we can pre-brief Jon on 1/28? Thanks for letting me know!

S.

Sara D. DeCair

http://www.epa.gov/radiation/rert/pags.html

202-343-9108

To: Christ, Lisa[Christ.Lisa@epa.gov]; Ellis, Jerry[Ellis.Jerry@epa.gov]; Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]
Cc: Veal, Lee[Veal.Lee@epa.gov]
From: DeCair, Sara
Sent: Fri 1/10/2014 4:50:49 PM
Subject: briefing scheduling

Lisa –

We are working on the scheduling and have tentatively chosen Feb. 6th for the ODs briefing and a pre-brief for Jon, our DD, for Jan. 21. That would require a draft briefing to be in hand on Jan. 17th, which is really soon! I wanted to check if that was a little too fast for you to get a draft together, even knowing it doesn't have to be final since DDs will also want to help shape it as well.

Thanks for letting me know what you think so we can look a little further out in to February if needed. Cheers,

S.

From: Christ, Lisa
Sent: Wednesday, January 08, 2014 5:22 PM
To: Ellis, Jerry; DeCair, Sara; Hernandez-Quinones, Samuel
Subject: RE: A few more nuclides to consider, and briefing scheduling

Hi Sara,

Sounds like y'all had a productive meeting last month. I think it would be great to update Petter and Mike on the progress made and thinking so far. About a month from now should allow time to pre-brief the acting Division Director in OGWDW. Peter's scheduler is Paula Mason – she'd best able to assist with scheduling. I suggest we prepare briefing materials together. We can prepare a 1st draft and sent it to y'all for input.

Thanks-

Lisa

From: Ellis, Jerry
Sent: Wednesday, January 08, 2014 5:12 PM
To: DeCair, Sara; Hernandez-Quinones, Samuel
Cc: Christ, Lisa
Subject: RE: A few more nuclides to consider, and briefing scheduling

Thank you Sara,

We will get back to you. Just copied Lisa.

Jerry L. Ellis, Jr.

Physical Scientist

Standards and Risk Management Division

Office of Ground Water and Drinking Water

U.S. Environmental Protection Agency

1200 Pennsylvania Ave. (4607M), N.W.

Washington, D.C. 20460

Phone: 202-564-2766

From: DeCair, Sara
Sent: Wednesday, January 08, 2014 3:57 PM
To: Hernandez-Quinones, Samuel
Cc: Ellis, Jerry
Subject: A few more nuclides to consider, and briefing scheduling

Happy New Year Sam, Jerry,

I'm finally following up on our water discussion recently!

You asked if other nuclides would be of interest, and I'm attaching a highly sensitive, internal use only chart that Lowell created back when we were reacting to accusations that our pre-proposal water PAG would be really horrible. You'll see a couple nuclides that have a slightly higher risk for a DRL linked to 500 mrem. Use that however you like, but of course don't share the chart electronically if you can avoid it. Thanks for that!

We talked about potentially briefing our ODs on the thinking so far, so that the work doesn't get too far before we have a good feeling from leadership. Can I start that scheduling process with Ginny, Mike Flynn's scheduler, and use you as OW's points of contact in addition to your OD's scheduler? If you say that's good, then I'll confirm with Lee and Jon and get the ball rolling for briefing time about a month from now.

Thanks for letting me know what you think, and I'll review this draft report now,

Sara

Sara D. DeCair

http://www.epa.gov/radiation/rert/pags.html

202-343-9108

To: DeCair, Sara[DeCair.Sara@epa.gov]; Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]
Cc: Christ, Lisa[Christ.Lisa@epa.gov]
From: Ellis, Jerry
Sent: Wed 1/8/2014 10:12:11 PM
Subject: RE: A few more nuclides to consider, and briefing scheduling

Thank you Sara,

We will get back to you. Just copied Lisa.

Jerry L. Ellis, Jr.

Physical Scientist

Standards and Risk Management Division

Office of Ground Water and Drinking Water

U.S. Environmental Protection Agency

1200 Pennsylvania Ave. (4607M), N.W.

Washington, D.C. 20460

Phone: 202-564-2766

From: DeCair, Sara
Sent: Wednesday, January 08, 2014 3:57 PM
To: Hernandez-Quinones, Samuel
Cc: Ellis, Jerry
Subject: A few more nuclides to consider, and briefing scheduling

Happy New Year Sam, Jerry,

I'm finally following up on our water discussion recently!

Ex. 5 - Deliberative Process

We talked about potentially briefing our ODs on the thinking so far, so that the work doesn't get too far before we have a good feeling from leadership. Can I start that scheduling process with Ginny, Mike Flynn's scheduler, and use you as OW's points of contact in addition to your OD's scheduler? If you say that's good, then I'll confirm with Lee and Jon and get the ball rolling for briefing time about a month from now.

Thanks for letting me know what you think, and I'll review this draft report now,

Sara

Sara D. DeCair

http://www.epa.gov/radiation/rert/pags.html

202-343-9108

To: Christ, Lisa[Christ.Lisa@epa.gov]
From: Hernandez-Quinones, Samuel
Sent: Tue 11/19/2013 3:42:24 AM
Subject: RE: R10 Radiation presentation
Slides for R10 States Meeting 11-21-13.pptx

Hi Lisa,

I'm sorry, I totally forgot to send the slides to you.

Please see attached. Let me know if you have any comments and I will send the updated version (if necessary) to Mr Becker.

Sam

From: Christ, Lisa
Sent: Monday, November 18, 2013 5:10 PM
To: Hernandez-Quinones, Samuel
Subject: R10 Radiation presentation

Hi Sam,

I believe R10 asked for presentations by COB today, do you have something for me to review?

Thanks-

Lisa

~~~~~~

Lisa Christ, Associate Chief
~~~~~~

Targeting and Analysis Branch

Office of Ground Water and Drinking Water

USEPA

1200 Pennsylvania Ave NW
Washington, DC 20460-0001
phone: 202.564.8354
fax: 202.564-3760

Mail Code: 4607M

To: Christ, Lisa[Christ.Lisa@epa.gov]; Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]; Ellis, Jerry[Ellis.Jerry@epa.gov]
Cc: Workman, Rosemary[Workman.Rosemary@epa.gov]; Allgeier, Steve[Allgeier.Steve@epa.gov]; Pickard, Brian[Pickard.Brian@epa.gov]
From: Pickard, Brian
Sent: Thur 10/31/2013 7:42:26 PM
Subject: 2013 PAG WSD Revisions/Comments
2013 PAG Manual-WSD Edits.103113.docx

Hello Lisa, Sam and Jerry,

Thanks for meeting with us on the PAG guidance document. As a follow-up to the meeting, we had agreed to provide suggested revisions to Section 3.5 to bring the section more into line with WSD's perspective/expertise. I've attached suggested text revisions (in yellow) for Sections 2.0, 3.0 and 4.0, along with some additional comments. These revisions also address comments from AWWA dealing with these topics.

A few notes:

Ex. 5 - Deliberative Process

Please feel free to contact me if you have any questions or comments on the suggested edits/revisions.

Thanks,

-Brian

Brian C. Pickard, P.E., BCEE

Team Leader, Security Assistance Branch

EPA OW-OGWDW-Water Security Division

Ph 202.564.0827/pickard.brian@epa.gov

To: Grevatt, Peter[Grevatt.Peter@epa.gov]; Bissonette, Eric[Bissonette.Eric@epa.gov]; Travers, David[Travers.David@epa.gov]; Newberry, Debbie[Newberry.Debbie@epa.gov]; Workman, Rosemary[Workman.Rosemary@epa.gov]; Christ, Lisa[Christ.Lisa@epa.gov]; St-Denis, Francine[St-Denis.Francine@epa.gov]; Oshida, Phil[Oshida.Phil@epa.gov]; Burneson, Eric[Burneson.Eric@epa.gov]; Eisenberg, Mindy[Eisenberg.Mindy@epa.gov]; Bergman, Ronald[Bergman.Ronald@epa.gov]; Lopez-Carbo, Maria[Lopez-Carbo.Maria@epa.gov]
From: Flaharty, Stephanie
Sent: Tue 10/29/2013 11:15:22 AM
Subject: Inside EPA: State Regulators Split On EPA Radiological Guide's Drinking Water Level

Daily News

State Regulators Split On EPA Radiological Guide's Drinking Water Level

Posted: October 28, 2013

Members of a state waste regulators group are conflicted over EPA's suggestion to develop a short-term emergency drinking water level following a radiological emergency as part of a draft radiological protection guide, while industry is calling for less-stringent requirements in the guide and environmental groups are reiterating their opposition to EPA's proposal.

In addition, states including members of the Association of State & Territorial Solid Waste Management Officials (ASTSWMO) as well as industry commenters on EPA's draft "Protective Action Guides and Planning Guidance for Radiological Incidents," known as the PAG for radiological incidents, are criticizing EPA for its assumptions that radioactive waste disposal following emergencies would fall only to the responsibility of states.

The guide is aimed at helping federal, state, local and tribal emergency response officials make radiation protection decisions during emergencies, according to EPA. The agency closed public comment on the draft PAG Sept. 16.

Some of the comments from ASTSWMO and environmental groups like Beyond Nuclear echo those made earlier by some states and environmentalists.

For instance, a few states previously have called on EPA to develop a specific drinking water level for the intermediate aftermath of a radiological emergency outside of the agency's traditional strict drinking water levels, while more than 100 environmental and citizen groups signed onto comments calling on EPA to drop all efforts to establish a drinking water protective level that is weaker than Safe Drinking Water Act (SDWA) limits.

Among the issues on which EPA sought feedback was the possibility of an intermediate -- what it dubs a "short-term" -- emergency drinking water PAG. EPA did not include such a standard in the draft, but asked for comment on the matter, and alludes in footnotes to several approaches by other entities that environmentalists say would be far less stringent than what SDWA permits.

Enforceable SDWA standards for radionuclides exist, but EPA says in the draft guide that it is not currently proposing a specific drinking water PAG. Rather, the agency advises that to the extent practicable, emergency measures for drinking water should be based on the National Primary Drinking Water Regulations (NPDWR) for Radionuclides, which give states flexibility when responding to radiological events.

If a public water system exceeds the NPDWR, it must work to return to compliance as soon as feasible, EPA says. The NPDWR provides for a regulatory standard of 4 millirems (mrem)/year based on lifetime exposure, but EPA says it is asking for input on an approach and technical rationale for a drinking water PAG for an emergency's intermediate phase -- generally considered from one year to seven years after the emergency -- to help officials determine protective actions under emergency conditions when exposures occur over shorter time periods than those expected in the NPDWR.

ASTSWMO's Sept. 13 comments are a varied collection of responses from the individual members of the group's radiation panel, with one state agreeing with the concept of including such a PAG, while another calling for using EPA's strict drinking water standards, known as maximum contaminant levels (MCLs), "when possible" during the early phase of such an emergency. A third state cautions against using any such water -- which would not meet EPA's MCLs -- for ingestion purposes.

A fourth state commenter says only in "*extreme* circumstances" could dose assessments be calculated that would correspond with the dose determined to be acceptable for the event by technical working groups. "This information would be communicated by decision makers or their designated public information officers."

And another ASTSWMO commenter says the threshold for a water standard, particularly in the first year, may be too stringent.

Industry's Comments

Industry is generally dismissing any use of NPDWR levels for the early or intermediate time periods following an emergency. In Sept. 16 comments, the Nuclear Energy Institute (NEI) says NPDWR values are appropriate for lifetime exposures in non-emergencies, while acute emergencies and intermediate time periods "are special and highly unusual circumstances for which routine drinking water characteristics described in the NPDWR should not be imposed."

In general, NEI says the updated draft PAG document offers "a more comprehensive and enhanced framework for decision-making during a radiological emergency that will continue to meet the essential principles for protecting public health and safety . . . that underlie effective emergency planning, preparedness and response."

Industry is also emphasizing the principle of balancing radiological protection with other factors and ensuring that actions provide more benefit than harm. NEI says this importance was highlighted by the actions taken in Japan following the tsunami-related nuclear accident there in 2011. "Some of the decisions taken for a single purpose (in this case, with the primary intent to protect against radiation exposure) were extremely disruptive and may have resulted in more social harm than good -- as recognized in recent publications regarding radiological protection issues and health risks associated with the Fukushima nuclear reactor accident," the comments say.

The group suggests EPA's limits for risks are conservative for the first year after an accident and in intermediate subsequent years. EPA's proposal suggests criteria of 2 rem in the first year, followed by 500 mrem in subsequent intermediate years. "We suggest setting a range of 2-10 rem per year for all anticipated pathways of exposure (inclusive of consumption of food or drinking water) which would greatly provide enhanced flexibility for balancing avoidance of potential radiological health risks with risks and impacts associated with disruptive protective actions," NEI says.

But environmentalists in recently filed comments are countering arguments about the lessons from the Fukushima accident.

In comments submitted by Beyond Nuclear, the group says the Japanese government, rather than relocating people, is attempting to persuade families that it is safe to live in contaminated areas. "EPA's PAGs would allow the same fate for U.S. victims of a nuclear catastrophe," the group says.

And the groups Alliance for a Green Economy and New York-based Citizens' Environmental Coalition write in Sept. 16 joint comments that the EPA proposal gives on-site emergency managers "extraordinary flexibility" following nuclear power plant accidents, the use of "dirty bombs" or other radiological incidents. EPA has moved away from its public health protection levels of between one in 10,000 and one in a 1 million cancers, according to the groups. "Under this guidance EPA would be allowing a rate of 1 in 23 [cancers] for a person exposed over a 30 year period," they say. They say the PAG should be scrapped and EPA should start over.

These groups also raise concerns that the guidance "allows for a broader range of actions which could enable sending radioactive materials to ordinary landfills and applying these standards to site clean-ups, such as those managed by the Department of Energy or the Nuclear Regulatory Commission."

EPA's Assumptions

Some commenters are also raising concerns over the assumptions EPA makes about waste disposal from radiological emergencies. Washington state's Department of

Health, for instance, says in Sept. 10 comments that an act of terrorism that would cause the need to dispose of radiological waste should not solely fall on states' shoulders. "To place this responsibility entirely on a state would bring about economic conditions that could possibly bankrupt state and local jurisdictions," it says.

NEI agrees that placing all responsibility for waste disposal on states "is an unreasonable assignment of responsibility for events involving significant contamination of land or structures." This issue should be further discussed between federal, state and local governments and other stakeholders, it says.

One ASTSWMO commenter expressed similar concerns, noting that there are numerous scenarios where waste disposal would not solely be a state issue.

"A large release could lead to low level waste volumes that are impossible to store realistically," the commenter says. "Standards need to be developed that ensure that the amount of low level waste generated can be accommodated at existing low level waste storage facilities. States are looking for realistic solutions."

To: Christ, Lisa[Christ.Lisa@epa.gov]
From: Davis, CatherineM
Sent: Thur 9/19/2013 3:01:10 PM
Subject: RE: Sen. Markey staff briefing request re: PAGs

Hi Lisa,

Well, it looks like 9/27 works for OSWER and OAR, so if you are able to change your CWD that would be great. Let me know what time works best for you, other than 12-3. Thanks so much for being accommodating.

Cathy Davis

Office of Congressional and

Intergovernmental Relations

202-564-2703

davis.catherinem@epa.gov

Send mail to:

US Environmental Protection Agency

1200 Pennsylvania Ave, NW

MC: 1305A

Washington, DC 20460

From: Christ, Lisa
Sent: Thursday, September 19, 2013 8:42 AM
To: Davis, CatherineM
Subject: RE: Sen. Markey staff briefing request re: PAGs

Hi Cathy,

It's my compressed day off, but I can make arrangements to be here if that's the only time that works.

Lisa

From: Davis, CatherineM
Sent: Thursday, September 19, 2013 8:38 AM
To: Christ, Lisa
Subject: RE: Sen. Markey staff briefing request re: PAGs

Hi Lisa,

We are having trouble finding common times for PAG briefing. Do you have any availability on Friday 9/27?

Cathy Davis

Office of Congressional and

Intergovernmental Relations

202-564-2703

davis.catherinem@epa.gov

Send mail to:

US Environmental Protection Agency

1200 Pennsylvania Ave, NW

MC: 1305A

Washington, DC 20460

From: Christ, Lisa
Sent: Monday, September 16, 2013 8:57 AM
To: Davis, CatherineM
Subject: RE: Sen. Markey staff briefing request re: PAGs

Hi Cathy,

My outlook calendar is always up to date.

Monday 9/16 – 4pm-6pm

Tu 9/17 – 12n-1pm or 5pm-6pm

W 9/18 - N/A

Th 9/19 – 12pm-1pm or 3pm-6pm

Friday 9/20 1pm-15pm

M 9/23 – 10am-6pm

Tu 9/24 – 10am-1pm or 4pm-6pm

W 9/25 – anytime after 10am

Th 9/26 – 1130am-1pm or 3pm-6pm

From: Davis, CatherineM
Sent: Monday, September 16, 2013 7:55 AM
To: Christ, Lisa
Subject: FW: Sen. Markey staff briefing request re: PAGs

Hi Lisa,

My sources (Maria) tell me that you're the OGWDW person for the in-person briefing on the recently issued Protective Action Guidance for Radiological Incidents requested by Senator Markey's office. Can you send me your availability for this week and next week?

Regards,

Cathy Davis

Office of Congressional and

Intergovernmental Relations

202-564-2703

davis.catherinem@epa.gov

Send mail to:

US Environmental Protection Agency

1200 Pennsylvania Ave, NW

MC: 1305A

Washington, DC 20460

From: Davis, CatherineM
Sent: Thursday, September 12, 2013 11:11 AM
To: Burneson, Eric; Lopez-Carbo, Maria
Cc: Klasen, Matthew; Peck, Gregory
Subject: Sen. Markey staff briefing request re: PAGs

Hi Eric and Maria,

Senator Markey's office has asked for an in-person briefing on the recently issued Protective Action Guidance for Radiological Incidents. They are continuing to hear many concerns about the guidelines and would like a technical briefing. Mike Flynn, Jon Edwards and Sara DeCair from OAR have agreed to participate, and Jon recommends also including Eric, as well as Dana Tulis.

OAR would like to meet after the comment period closes (on the 16th), and they are generally available over the next couple weeks. Can you let me know if Eric is available and the right person for the briefing? If so, Eric, can you let me know what your availability is in the next 2 weeks.

FYI, OAR sent the following article.

Thanks,

Cathy Davis

Office of Congressional and

Intergovernmental Relations

202-564-2703

davis.catherinem@epa.gov

Send mail to:

US Environmental Protection Agency

1200 Pennsylvania Ave, NW

MC: 1305A

Washington, DC 20460

From: Perrin, Alan

Sent: Thursday, September 12, 2013 9:44 AM

To: Lewis, Josh; Levine, Carolyn

Subject: article, FYI

FYI, this is the latest (9/11) National Journal article from Doug Guarino; it focuses on the PAGs. It is not a particularly accurate or well-written article, but I thought you might be interested. –Alan

http://www.nti.org/gsn/article/epa-documents-raise-doubts-over-intent-new-nuclear-response-guide/

~~~~~~~~~~~~~~

Alan Perrin, Deputy Director
~~~~~~~~~~~~~~

Radiation Protection Division, USEPA

office (202) 343-9775 | bb (202) 279-0376

To: Burneson, Eric[Burneson.Eric@epa.gov]
Cc: Christ, Lisa[Christ.Lisa@epa.gov]
From: Travers, David
Sent: Fri 9/13/2013 7:43:05 PM
Subject: RE: Homeland Security | Research Priorities | Research | US EPA

Fair enough. I've sent Lisa the comments which I (and presumably you) received from AWWA on the PAG, which more or less reflects WSD's thinking on the preparedness portion of the PAG. We did not have any initial comments, other than to note/cite the "Planning for an Emergency Water Supply" document and to forward readers to this document for more information on the subject.

AWWA's comments 4, 5 and 7 seem to reflect this, which is not surprising considering AWWA co-funded the document. Other comments seemed more in the ORD realm.

There were some assumptions about water systems storage and usage during a radiological event that were questioned (comment 4, 5) - it seems to me that the Simulation study/modeling work that Steve Allgeier is doing for the Greater Cincinnati Water Works may be leveraged/re-purposed to explore some of these assumptions more directly, if desired.

D

-----Original Message-----
From: Burneson, Eric
Sent: Friday, September 13, 2013 3:36 PM
To: Travers, David
Cc: Christ, Lisa
Subject: RE: Homeland Security | Research Priorities | Research | US EPA

No need for a disclaimer/ or to take one for the team. I understand completely and appreciate the manner in which WSD "stays in their lane." Ex. 5 - Deliberative Process
We are committed to working with OAR to address public comments on the draft PAG (several of which have referenced this document). OAR has suggested we work with the author of this document and with commenters to use the concepts in this document to further modify the PAG. Since the concepts in the document address system resiliency I would welcome the opportunity to work your staff on the recommendations that fall more in the Water Security Lane than the Standards and Risk Management Lane.

-----Original Message-----
From: Travers, David
Sent: Friday, September 13, 2013 2:06 PM
To: Burneson, Eric
Cc: Christ, Lisa
Subject: RE: Homeland Security | Research Priorities | Research | US EPA

Apologies for this one: I have asked staff that in the future if they see any language pertaining to the regulatory aspect of the program that they coordinate with SRMD or DWPD as appropriate. Regs are not something we would usually care about in the insular world of our emergency response program, but clearly at least as a courtesy we should inform you all about reg matters and not assume you are engaged in reviewing these documents. Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

-----Original Message-----

From: Burneson, Eric
Sent: Friday, September 13, 2013 1:58 PM
To: Travers, David
Cc: Christ, Lisa
Subject: RE: Homeland Security | Research Priorities | Research | US EPA

Thanks; I have some concerns about the interpretations of our regulations in appendix B but will temper my remarks if they have previously consulted with OGWDW. Perhaps the best way to approach this is to continue to work with your folks to help to pull information out of this document that could be useful for developing a drinking water PAG.

-----Original Message-----
From: Travers, David
Sent: Friday, September 13, 2013 11:40 AM
To: Burneson, Eric
Cc: Christ, Lisa
Subject: FW: Homeland Security | Research Priorities | Research | US EPA

So we were engaged as reviewers of this document.

-----Original Message-----
From: Pickard, Brian
Sent: Friday, September 13, 2013 7:26 AM
To: Travers, David; Workman, Rosemary; Tidwell-Shelton, Patricia
Cc: Pickard, Brian
Subject: RE: Homeland Security | Research Priorities | Research | US EPA

The ER Team engaged in this effort; Kevin T. attended the initial meeting in June 2009, and Nushat attended two additional meetings Dec 2009 and Jan 2010. Nushat is also listed as a peer reviewer.

I'm looking over the AWWA comments this morning and will send along some feedback.

-Brian

-----Original Message-----
From: Travers, David
Sent: Thursday, September 12, 2013 5:03 PM
To: Workman, Rosemary; Tidwell-Shelton, Patricia
Cc: Pickard, Brian
Subject: FW: Homeland Security | Research Priorities | Research | US EPA

Please let me know if we engaged in developing this document, thanks.

-----Original Message-----
From: Burneson, Eric
Sent: Thursday, September 12, 2013 4:59 PM
To: Travers, David
Cc: Christ, Lisa
Subject: Homeland Security | Research Priorities | Research | US EPA

David:
I need to get a handle on the extent to which OGWDW worked with NHSRC on the document in the link below. Particularly page 8 and Appendix B. Its being raised in the context of the PAGs discussion with OAR. Can we touch base when you have a chance?

http://cfpub.epa.gov/si/si_public_record_report.cfm?address=nhsrc/si/&dirEntryId=235197

Eric

To: Christ, Lisa[Christ.Lisa@epa.gov]; Burneson, Eric[Burneson.Eric@epa.gov]; Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]
From: DeCair, Sara
Sent: Thur 9/12/2013 8:20:44 PM
Subject: Very interesting H2O cmts from AWWA
American Water Works Assoc cmts 9-2013.pdf

FYI, we do have a few other comments mentioning water, but this set from AWWA is the most substantive. Lee has some good ideas for looping in NHSRC as we discuss what's next.

Sara

From: Veal, Lee
Sent: Thursday, September 12, 2013 4:06 PM
To: DeCair, Sara; Perrin, Alan; Edwards, Jonathan
Subject: RE: Very interesting H2O cmts from AWWA

Sara,

I'm not an expert of water distribution systems, but these comments appear to be well thought out and helpful. It may be important to have NHSRC in on the discussions with OW about these, at least the ones on the distribution side.

Kathy Nickel is the NHSRC contact for the report that AWWA cites. She has been tremendously helpful for WARRP projects and is an HP. Here is the link for the report:

http://cfpub.epa.gov/si/si_public_record_report.cfm?address=nhsrc/si/&dirEntryId=235197

I know Kevin Morley as does Jon from OHS days. He was good to work with then and I suspect would be now.

Lee

Lee Ann B. Veal

Director, Center for Radiological Emergency Management

Radiation Protection Division, ORIA, OAR

Office: 202-343-9448

Ex. 6 - Personal Privacy

From: DeCair, Sara
Sent: Thursday, September 12, 2013 2:55 PM
To: Veal, Lee; Perrin, Alan; Edwards, Jonathan
Subject: Very interesting H2O cmts from AWWA

You'll be glad to see that the American Water Works Association gave us some very detailed and interesting input on the water PAG question. I've attached a copy of the letter they submitted to the docket, and note that they cc'ed Peter Grevatt and David Travers in OW.

Stay tuned!

Sara D. DeCair

http://www.epa.gov/radiation/rert/pags.html

Ex. 6 - Personal Privacy

American Water Works Association

Government Affairs Office
1300 Eye Street NW
Suite 701W
Washington, DC 20005-3314
T 202.628.8303
F 202.628.2846

September 10, 2013

U.S. Environmental Protection Agency
Air and Radiation Docket and Information Center
Mail Code: 6102T
1200 Pennsylvania Ave NW.
Washington, DC 20460

RE: Updates to Protective Action Guides Manual: Protective Action Guides (PAGs) and Planning Guidance for Radiological Incidents, Docket ID No. EPA–HQ–OAR–2007–0268

Dear Sir or Madam,

The American Water Works Association (AWWA) is an international, nonprofit, scientific and educational society dedicated to providing total water solutions assuring the effective management of water. Founded in 1881, the Association is the largest organization of water supply professionals in the world. Our membership includes more than 4,000 utilities that supply roughly 80 percent of the nation's drinking water and treat almost half of the nation's wastewater. Our 50,000-plus total membership represents the full spectrum of the water community: public water and wastewater systems, environmental advocates, scientists, academicians, and others who hold a genuine interest in water, our most important resource. AWWA unites the diverse water community to advance public health, safety, the economy, and the environment.

In response the request for comments issued April 15, 2013, 78 FR 22257, regarding the *Protective Action Guides and Planning Guidance for Radiological Incidents*, AWWA is submitting comments focused on drinking water as specified below (EPA comment request in bold):

1. ***EPA is seeking input on an approach and technical rationale for a drinking water PAG designed to help officials select protective actions under emergency conditions when exposures would occur over shorter time periods than those envisioned in the National Primary Drinking Water Regulation (NPDWR).*** (3.5. Protective Action Guidance for Food and Drinking Water, page 42)

Rather than relying on drinking water regulations with regard to a potential intermediate phase PAG for drinking water, the Agency should consider the following approach:

- Establish PAGs for drinking water consistent with PAGs for food interdiction; i.e., 0.5 rem/yr (500 mrem/yr) during the intermediate period. This could be applied in limited situations when alternative water sources are inadequate or otherwise compromised.
    - For ^{131}I, with a concentration of 3 pCi/L (= 4 mrem/yr), the average concentration over a year giving a dose of 500 mrem would be 375 pCi/L.
    - For ^{137}Cs, with a concentration of 200 pCi/L (= 4 mrem/yr), the average concentration over a year giving a dose of 500 mrem would be 25,000 pCi/L.

- This framework can be compared with the drinking water MCL for beta-photo emitters of 4 mrem/yr and background radiation of ~300 mrem/yr.

- An alternative approach would be to limit the dose to 4 mrem during a short exposure period (e.g., the first 4 days of the early period)
    - For ^{131}I, the concentration of 3 pCi/L (= 4 mrem/yr) for 730 liters drunk over 1 year would be equivalent to 8 liters of water containing 274 pCi/L of ^{131}I consumed in 4 days.
    - For ^{137}Cs, the concentration of 200 pCi/L (= 4 mrem/yr) for 730 liters drunk over 1 year would be equivalent to 8 liters of water containing 18,250 pCi/L of ^{137}Cs consumed in 4 days.
    - This would require explanation from EPA and State officials that this equivalent dosage is acceptable under the emergency conditions.

- For the late phase when recovery actions take place, the use of drinking water regulations (at entry points to the distribution system) would be appropriate.

2. ***To determine if there is radiological contamination of drinking water sources and the extent to which such contamination is occurring, systems sampling for radionuclides must use approved EPA methods.*** (3.5.1. Monitoring & Characterization of Contaminants , page 43)

In an emergency situation, AWWA recommends that EPA allow the methods that are most simple and rapid in order to aid in getting the quickest possible decisions about the safety of the water supply. Methods such as those referenced in ***Rapid Radiochemical Methods For Selected Radionuclides In Water For Environmental Restoration Following Homeland Security Events*** should be acceptable under emergency conditions. It worth noting that AWWA has previously recommended that the Agency address the variability associated with current drinking water compliance methods (Eaton et al., 2011).[1] Any such determination should be issued in an updated and revised version of ***Standardized Analytical Methods for Use During Homeland Security Events***.

[1] Eaton, A., Cha, Y., Geddes, L., & Morley, K.M. (2011). Evaluation of variability in radionuclide measurements in drinking water. *Journal - American Water Works Association*, *103*(5), 119-130.

3. ***During a radiological event, water systems may be dealing with a number of requirements and operating procedures and may not be prepared to issue public notification. The state may issue public notification on behalf of the water system.*** (3.5.2. Public Notification, page 43)

During an emergency, especially one related to a radiological incident, either the State or EPA would presumably take lead responsibility for public notification. This would not be unlike large events such as Superstorm Sandy, where the State was often the principle means for notification for situation awareness, including in the case of water systems informing the public of boil water notices. During such emergencies the water system resources are likely to be strained. Water system focus should be on returning the water supply to a safe condition as soon as possible, and EPA or state authorities should assume responsibility for communicating with the public. However, in conformity with the Incident Command System, the water utility personnel should be involved with and be present during any briefings, press conferences or other any public communications appearances.

4. ***Water distribution systems all incorporate reserve and storage capacity. During the early phase of an incident it is unlikely that contamination could affect water which is directly available for consumption through distribution systems. It would take some time for radionuclides to be deposited from the plume into the supply system water source and then subsequently be distributed. During the early phase, recommendations to the public (i.e., about drinking tap water) should reflect these considerations. The public should be advised that the water is safe to drink unless otherwise informed by state officials. Some useful and practical actions water systems can take during the intermediate phase to provide drinking water to customers are described below.*** (3.5.3. Corrective Actions to Reduce Levels of Contamination, page 43-45)

We question the assumptions that the Agency is making in regards to distribution system reserve/storage capacity as we believe they are naïve. First, not all systems have significant reserve and storage capacity, and the proposal does not account for factors that could be unique to those systems with open finished water reservoirs. It should also be noted that storage capacity will be significantly influenced by the time of day and time of year; therefore the Agency should consider a worst reasonable case scenario where storage is at a minimum and the treatment plant(s) are running at full capacity to meet peak demand. Under such conditions, we believe that it would be prudent to advise the treatment plants to shut down immediately to mitigate potential contamination of the distribution system. AWWA welcomes the opportunity to explore these options further with the Agency and recommends leveraging the approaches outlined in ***Planning for an Emergency Water Supply***, a resource developed collaboratively with the National Homeland Security Research Center.

5. ***From the section "Wait for Flow-By" - During this time, the system's existing storage capacity can be depended upon. If the stored water supplies could be depleted before the affected valves can be reopened, treatment of the contaminated water while using available stored water supplies should be considered. This assumes that the treatment technology will be in place or readily accessible.*** (3.5.3. Corrective Actions to Reduce Levels of Contamination, page 44)

The Agency's assumption is unreasonable, particularly within a large water system. Depending upon the radionuclide of concern, the only treatment options may be membrane filtration or ion exchange. Given the volume of water in some utilities, it should be noted that currently the largest mobile treatment system is a 1 MGD low –pressure membrane filtration unit. That is likely to be inadequate to handle the demand in a larger system. Moreover, such units create questions about the ability to directly pressurize the distribution system.

6. ***From the section "Establish Pipeline Connections to Closest Sources/Systems" - Running a pipeline from a "clean" water supply system to various distribution centers located throughout the affected community is a routine means of providing clean water.*** (3.5.3. Corrective Actions to Reduce Levels of Contamination, page 44)

AWWA collaborated with EPA-NHSRC to develop ***Planning for an Emergency Water Supply*** to address the options and factors that must be considered under emergency circumstances. This option as proposed assumes that a clean source of supply exists, which runs counter to EPA's own analysis as performed by the Environmental Assessment Division of Argonne National Laboratory. The Argonne analysis examines some of the likely impacts on water and wastewater operations. A similar analysis was also performed by the Department of Homeland Security (Porco, 2010).[2] The suggestion also presumes that the impacted community has not self-evacuated or been mandated to evacuate, which significantly alters demand. It should also be noted that running a pipeline to an affected area as suggested will require engineering expertise to select the route, the labor force and equipment to run the line, and likely, a hydraulic model to determine if the pipeline can be effective. These resources may not be available under emergency conditions.

[2] Porco, J.W. (2010). Municipal water distribution system security study: recommendations for science and technology investments, *Journal - American Water Works Association*, *102*(4): 30-32.

7. ***"However, the Agency recognizes a short-term emergency drinking water guide may be useful for public health protection in light of the Fukushima nuclear power plant accident, which impacted some Japanese drinking water supplies. Input on the appropriateness of, and possible values for, an intermediate phase emergency drinking water PAG is being sought during the public review of this Manual."*** (3.5. Protective Action Guidance for Food and Drinking Water, page 42)

AWWA collaborated with EPA-NHSRC to develop ***Planning for an Emergency Water Supply*** to address the options and factors that must be considered under such circumstances. In addition, we would advise EPA to work with CDC and FEMA (www.READY.gov) to ensure messaging is consistent among various federal authorities from whom the public is likely to seek information following such an incident. AWWA has worked also with CDC and EPA to develop the ***Drinking Water Advisory Communication Toolbox*** which should also be considered as another resource to be leveraged.

AWWA believes a meeting with EPA staff to examine this issue in further detail would be beneficial. Please do not hesitate to contact me or Dr. Kevin Morley, kmorley@awwa.org, if you have questions about these comments.

Sincerely,

Tom Curtis
Deputy Executive Director
American Water Works Association

cc: Peter Grevatt, OGWDW
David Travers, OGWDW/WSD

To: Hernandez-Quinones, Samuel[Hernandez.Samuel@epa.gov]
Cc: Christ, Lisa[Christ.Lisa@epa.gov]
From: Ellis, Jerry
Sent: Wed 8/14/2013 9:55:01 PM
Subject: Summary of meeting today with ORIA

Hi Sam,

Here is a quick update. Lisa may have some additional thoughts.

Ex. 5 - Deliberative Process

Jerry L. Ellis, Jr.

Physical Scientist

Standards and Risk Management Division

Office of Ground Water and Drinking Water

Phone: 202-564-2766

To: Perry, Sam A (DOH)[Sam.Perry@DOH.WA.GOV]; Burneson, Eric[Burneson.Eric@epa.gov]; Christ, Lisa[Christ.Lisa@epa.gov]
Cc: Means, Mike J (DOH)[mike.means@DOH.WA.GOV]; Clifford, Denise (DOH)[Denise.Clifford@DOH.WA.GOV]
From: Grubbs, Thomas
Sent: Tue 8/6/2013 6:54:18 PM
Subject: RE: Radionuclide exposure in drinking water - Short-term HALs/PAGs (Draft EPA Guidance)

Sam – I am not the right person. Eric is acting division director, so I am copying Lisa Christ, who is the acting branch chief for the branch that does radionuclide issues.

Lisa – Thanks for any help you can give Sam.

Tom

From: Perry, Sam A (DOH) [mailto:Sam.Perry@DOH.WA.GOV]
Sent: Tuesday, August 06, 2013 2:42 PM
To: Grubbs, Thomas; Burneson, Eric
Cc: Means, Mike J (DOH); Clifford, Denise (DOH)
Subject: Radionuclide exposure in drinking water - Short-term HALs/PAGs (Draft EPA Guidance)

Hi Tom and Eric,

I am working with colleagues in the WSDOH Office of Radiation Protection on putting together comments on a the draft PAG Manual - Protective Action Guides and Planning Guidance for Radiological Incidents. See http://www.epa.gov/radiation/docs/er/pag-manual-interim-public-comment-4-2-2013.pdf

In the manual, there is discussion of drinking water (See Section 3.5 if you're interested).

To help facilitate coordination between EPA programs on this issue, I suggested that our Rad folks copy staff in EPA-OGWDW. Who you think it would be best to copy when in our comments on the development of short-term health advisory levels/PAGs for radionuclides? You? Phil Oshida? Ann Codrington?

I'd appreciate any direction that you can provide.

Thanks,

Sam

Samuel A. L. Perry, P.E.
Water Treatment Engineer
Office of Drinking Water
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Public Health **- Always Working for a Safer and Healthier Washington**

***** This message may be confidential. If you received it by mistake, please notify the sender and delete the message. *****

To: Christ, Lisa[Christ.Lisa@epa.gov]
Cc: Ellis, Jerry[Ellis.Jerry@epa.gov]
From: Hernandez-Quinones, Samuel
Sent: Mon 4/22/2013 4:06:26 PM
Subject: RE: TPs for Eric on the Rads PAG
Talking Points Stakeholder Mtg.docx

Lisa,

Please see attached talking points. Since we are not committing to any particular approach I tried to keep it very general.

Let me know if you would like me to add anything else.

Sam

From: Christ, Lisa
Sent: Friday, April 19, 2013 10:12 AM
To: Hernandez-Quinones, Samuel
Cc: Ellis, Jerry
Subject: TPs for Eric on the Rads PAG

Hi Sam,

Please prepare talking points for Eric on the Rads PAG and send them to me by noon Monday. ORIA scheduled a call on April 23 with Enviro groups who have questions about the draft PAG Manual out for comment. I'll be out on furlough on April 23 so Eric is covering. I'm not sure what groups will be on the call, but you may remember that Bob P. has been approached and met with enviros on this topic before (see attached letters). I would guess concerns similar to those in letters will be raised on the call.

Thanks-

Lisa

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Lisa Christ, Associate Chief

Targeting and Analysis Branch

Office of Ground Water and Drinking Water

USEPA
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